American Machinist

A McGraw-Hill Publication . . . Established 1877

New York, April 24, 1930

*

What of the Foundry?

Just what has the machine shop the right to expect from the foundry? The argument of this article is that the attitude of the shop in accepting faulty castings as inevitable, has retarded foundry technique more than it has forwarded it

By Chester B. Lord
Associate Editor

THE PHILOSOPHER, when questioned on his opinion concerning the equality of man and woman, always asks, which man and which woman? When we ask why is a foundry different, why do we have so much trouble with its output, and what have we a right to expect from it, it is also good policy to specify what foundry and what output. Carrying the figure a little further, the problem often seems to be whether it is easier to get along with the foundry, or to get along without it. There are good foundries, those that reflect the general efficiency of the plant of which they are a part, and others that we feel apologetic for as we show it to visitors, and apoplectic when we view its output.

It is necessary to make a distinction between those foundries that do repetitive work, and those that make only a few castings from a pattern or possibly only a single one. The repetitive foundries can be ignored as having no bearing upon the questions that have been asked. They are the efficient, social superiors of all the

craft. Naturally, if it is possible to correct mistakes by changing the mixture of the iron, altering the shape of the pattern, and by trying out different kinds of sand mixtures, there is no reason why any foundry should not deliver castings of uniform hardness and in any desired quantity. Under such conditions a hundred or more castings may be spoiled in experimental heats, without causing a ripple in the shop, but in the jobbing foundry when only a single casting is wanted, and it is necessary to cast it several times, the foundry comes in for a lot of sarcastic comment about furnishing its own scrap.

The question as amended then is: What has the shop a right to expect from the average foundry that is not equipped specifically for repetitive work?

THE shop believes, rightly or wrongly, that most of the troubles that it experiences with castings are avoidable, and that it has the right to expect the total elimination of blow holes, porous spots, and sand pockets in castings that reach its floor. It also believes that castings should come to it reasonably clean, properly chipped, and with a surface finish compatible with the use to which the casting is to be put. A workman-like casting is just as conspicuous as a workman-like job in any other trade.

The shop reasonably expects that the draft on deep castings will not be so great as to require an extra cut the full length or width of the casting, and that the finish will not exceed that agreed upon as reasonable by both the shop and foundry—that bosses will be located as the drawing calls for and that the holes in them shall either be eliminated or so placed that it will not be necessary to machine the outside of the boss in order to have it appear concentric with the hole. Floating bosses are a strain on any shopman's disposition.

It goes without saying that where a circular casting is made in two or more sections, the ends of the segments shall not flare sufficiently to require additional machine work; where a box and a cover are intended to fit without machining they shall be so made, and that the lugs and bosses on both parts shall coincide.

Castings similar to cylinders should certainly be cast so that the overall length and the thickness of both flanges may be machined according to drawing, and the counterbore at the end shall be concentric and deep enough so that a single cut is sufficient to clean it up; the walls of the cylinder should be of even thickness within reasonable tolerances. Castings similar to motor frames should have the distance from the center of the frame to the bottom of the feet so that the specified thickness of feet may be maintained; neither in these nor any other castings should there be horizontal or vertical offsets sufficient to require extensive chipping to correct.

The shop also expects that castings such as piston ring pots shall have lugs for clamping or bars for holding, whether the drawing calls for them or not, and that convex castings such as pots or covers shall have equalizing lugs cast in such a manner that they can be broken off close to the casting after the machining is done.

Flanges on mating castings shall be of the same outside dimensions and be wide enough to allow of counterboring on the unfinished side without cutting away the vertical flank or rib next to them.

Above and beyond all other demands, the shop expects that the foundry will not attempt to deceive it by using filler, or "Smooth On," no matter how artistically it may be applied, or how invisible it may be to the casual observer. The shop prefers to judge for itself whether "the casting is perfectly good" and whether the filler does harm or not. Beside, it is embarrassing to have the customer's inspector go over the casting with his little hammer, and ask you for a chipper to dig the filler out. Filling cracks and porous spots with wax and filler is an old trick, as old as the Romans. The practice was so prevalent among Roman marble cutters that it became necessary to give a written guarantee that articles furnished were "sine cere," — without wax, or filler.

Welding, unless sanctioned by the inspector, and done after preheating the casting, is also objectionable, and is equally embarrassing to the shop when discovered by an outside inspector, especially when the shop is trying to impress the said inspector with the honesty of its practice and the quality of its castings.

LASTLY the shop expects from the foundry castings that can be recognized in some other way than by their shape. It expects the order number to be legibly painted on large castings, together with the pattern number, if the latter is not cast on the part. For small castings its expects a tag will be attached to one of each kind, and that the tag and the lettering will withstand the weather if the casting is stored out of doors.

The shop believes that all of the troubles enumerated above are avoidable; it has left out of the indictment those castings that come bad because of faulty design or insufficient allowances on the part of the engineering department; although it might with some justice, claim that it is a duty on the part of the foundry to educate the engineering department. The fact that a thing is called for on the drawing is no longer an alibi for the shop. It must tell the engineering department that it is

not right and tell them how to make it so. Incidentally it may be stated emphatically, that the difference between those plants that can successfully make complicated machinery such as 10,000-hp. Diesel engines and equally large steam turbines, and those that cannot, is that one has design engineers that understand machining processes, and the other has not. Those foundries that can consistently cast 50-ton water-turbine wheels that are in balance, and 50-ton locomotive frames with integral cylinders and steam-chests, have design engineers with a scientific knowledge of casting technique. Other plants, who can do none of these things, have simply designing engineers.

Not long ago I was asked by the management why a certain foundry could not produce a new type of turbine casing for which the shop was anxiously waiting. My reply was that the foundry was in exactly the same position the shop would be in if it were asked to build the turbines with nothing but an assembly drawing.

"The shop could build a triple expansion reciprocating engine without drawings, because it had built many of them. It could do the same with a steam turbine, given unlimited time, but only by the trial and error method. The foundry is up against the same proposition on casting the casings. It can produce a 90 per cent casting, but a 100 per cent one is a matter of experience, and it must secure the experience by trial and error."

The shop believes it is justified in expecting the things set forth. Founding is a primary art, it deals with raw materials that it can control, and while it has more than its share of output troubles, it has none of the material difficulties that beset the secondary arts that depend upon others for fabricated material.

The shop, even while admitting that the foundry is "different" believes that the application of shop methods to foundry practice would solve most, if not all, of its troubles, because in both cases management consists mainly of mechanical common sense.

Removing Bolts by Stretching Them

By P. H. White

SEVERAL years ago, while employed in a locomotive "back shop," I was shown the following method of removing frame bolts which had become badly corroded in place and consequently were difficult to remove. In this method the nut was first removed, and the bolt was struck a few heavy blows with a hammer, the threads being protected meanwhile. If the bolt failed to respond to the hammer blows, the threads were oiled and the nut replaced with two or three washers underneath. A wrench with an extended handle was then applied and the nut screwed down tight against the washers. The bolt head was next given several blows with a heavy sledge and the wrench applied again. This process of alternately hammering the head and screwing down the nut was continued until the bolt either broke or the threads stripped. A handled punch and sledge were then applied, and only a few blows were required to remove the bolt. Indeed, often the bolt could be tapped out with a light hand hammer. Removal of a bolt in this fashion is effected by stretching the metal beyond its yield point and consequently elongating the bolt and reducing its cross-section so that it is loosened in the hole.

SEEN · AND · HEARD

By JOHN R. GODFREY

Hammermen in the Orient— Round Machine-Guides

THE forging of iron and steel seems to be in the blood of men in most parts of the world, the Orientals being no exception. One of the noticeable differences, however, is in the way the hammerman handles his hammer, especially the hammers of the helve, crank and spring type, and air driven hammers. At home we find the hammerman with his foot on the treadle or loop or bar, controlling the force of the hammer at each blow. He knows just the blow he wants and keeps the whole operation under his own control.

In the Orient, however, the hammerman feels differently about it. In most cases the foot control has been removed so that he cannot control it if he would. In its place is a secondary control, usually on the side of the hammer frame as on a steam hammer. The helper controls the stroke of the hammer instead of the hammerman as with us. The difference in cost is probably not very much owing to the low wage rate, especially of the helper. The main difference seems to be in the psychology of the men, one preferring to have everything under his own control and the other wanting a helper, perhaps so as to have someone to blame for a blow of the wrong kind!

* * * *

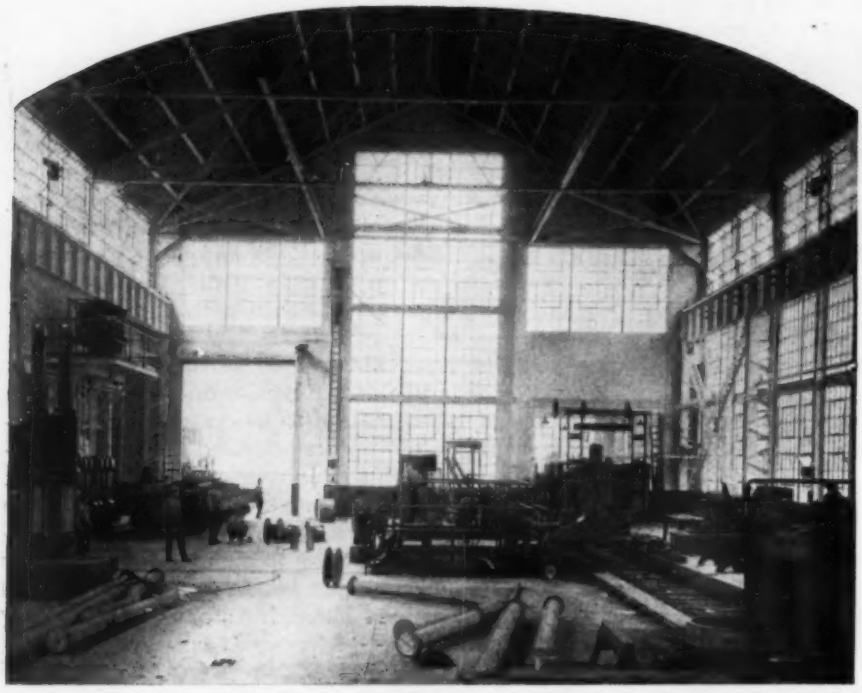
ROUND bars as guides for moving parts of machinery have bobbed into being at various times on many kinds of machines. Both double and single bars have been used for guiding tool carriages on small lathes, a keyway preventing the carriage from turning on the single bar construction. Originally used on small, cheap machines, the method grew into use on shell lathes during the war and, in improved form, is now being used on some thoroughly modern machines. With accurately ground bars, held squarely in position, the method adapts itself readily to several classes of machines.

Round bars have also come to be used in another manner, particularly in the swinging of a tool or grinding wheel into work. In some cases, the head or carriage swings on the bar; in others, the head or carriage is clamped to the bar which swings in two separate bearings. In still others, the bar both swings and slides in its bearings to secure both radial and longitudinal feed.

The use of bar supports for a radial feed is claimed to have an advantage in some work, such as the machining of the fins on the outside of air-cooled airplane engines. One of my good friends insists that he gets better and smoother work by swinging the tool head with the numerous parting tools into the work than he can get with similar tools held in a sliding toolpost, where the oil film may squeeze out from between the slides as the tools feed in. Since this gives a looser fit in the slides, the tools show chatter marks on the fins. While it is always possible to be mistaken, it is a point that may be worth considering in designing machines for work of this kind.

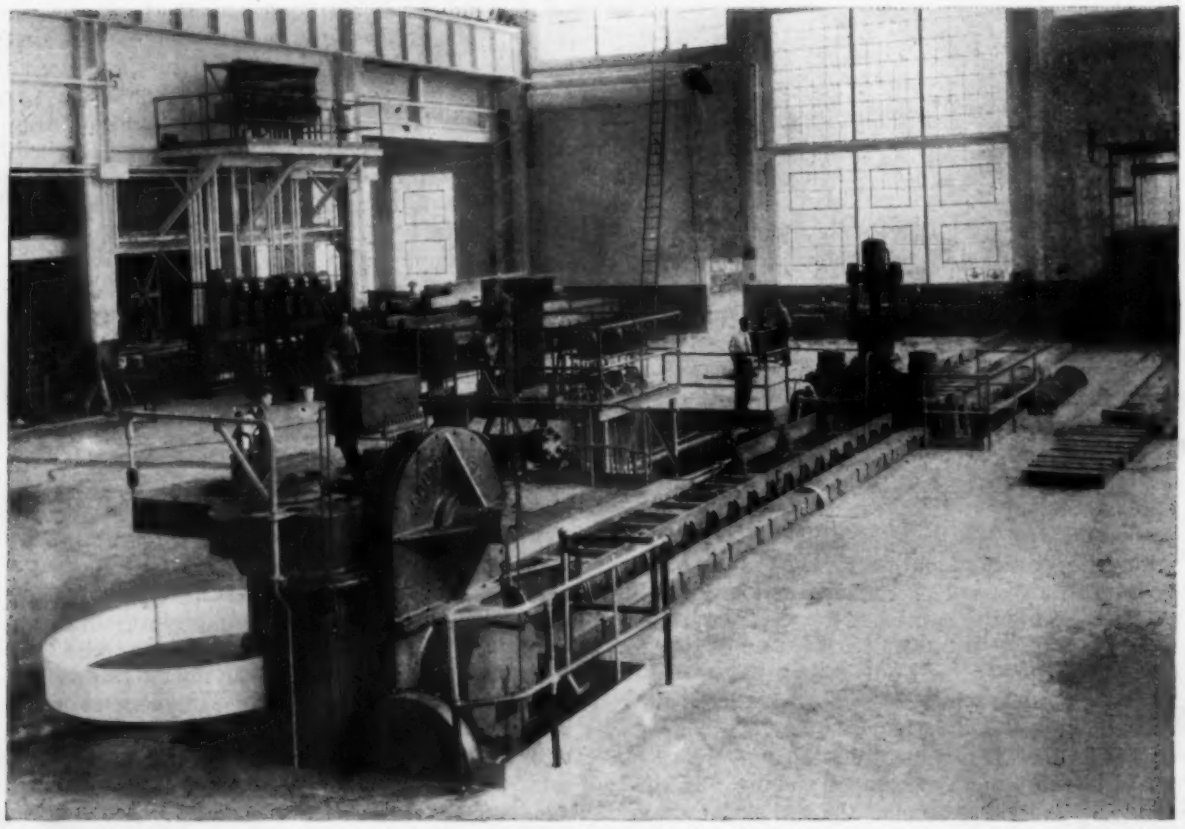
From Nine-Inch Slab to Welded Motor Frame

Material submitted by C. C. Brinton, manufacturing engineer, Westinghouse Electric & Manufacturing Company.

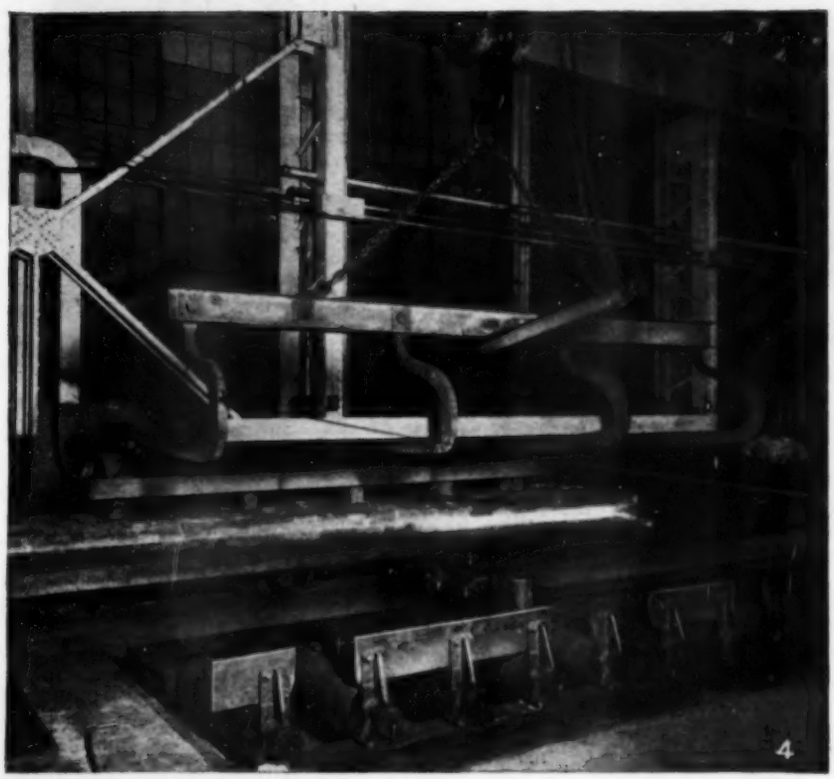


ROLLED STEEL slab has been called an ideal material for large motor and generator frames because it is free from porosity and blow holes, and because it may be formed and welded economically into fabricated structures, using forming and rolling equipment. Such equipment has been installed in the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Company. Steps in the fabrication of a motor frame, from the slab to the finished motor, are here shown.

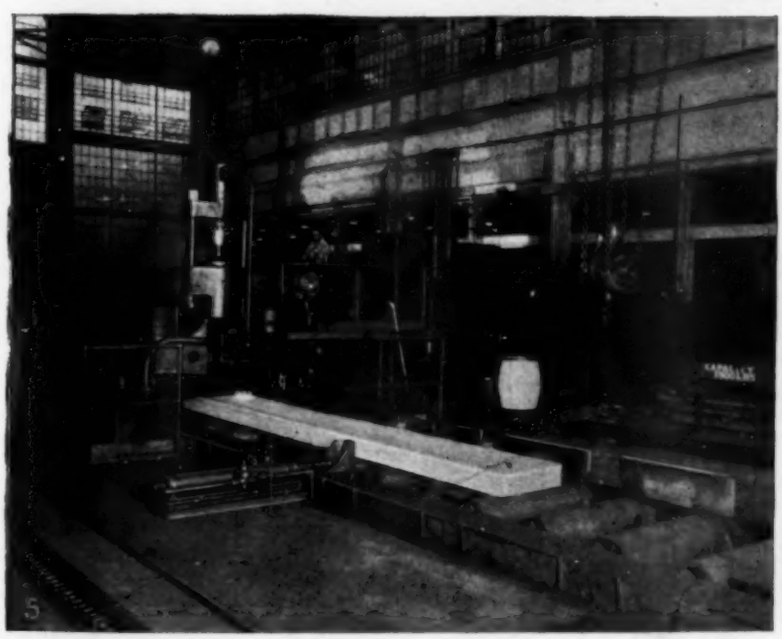
A view down through the shop, which appeared on page 43, Vol. 72, will be remembered. The shop is 170 ft. long, 75 ft. wide, and 40 ft. high. A railroad siding permits the slab to be run directly into the shop so that the overhead traveling crane can be used to transfer it directly to the furnace. After being heated to the requisite temperature, the slab is removed from the furnace on a special car and laid down on the power-driven rolls before the crimping press. Crimping is necessary to prevent straight ends on the slab after is is passed through the bending rolls shown in the foreground of the lower photograph. Centralized control of all equipment is located at the "pulpit."



Upper half of a frame for an 8,000-hp. reversing mill motor. Two slabs 31 in. wide, 9 in. thick and 302 in. long and weighing 2,600 lb. each are required for this half. The two pieces are welded side by side and the bolting lugs at the partings and the lifting rings are welded on also



Heated slab being removed from the furnace car to the power-driven conveyor rolls in front of the crimping press. The special carrier drops the slab on the rolls and the hooks slide clear through the openings in the guides at the edge of the rolls. The slab is heated to 2,000 deg. F., in the car furnace at the rear

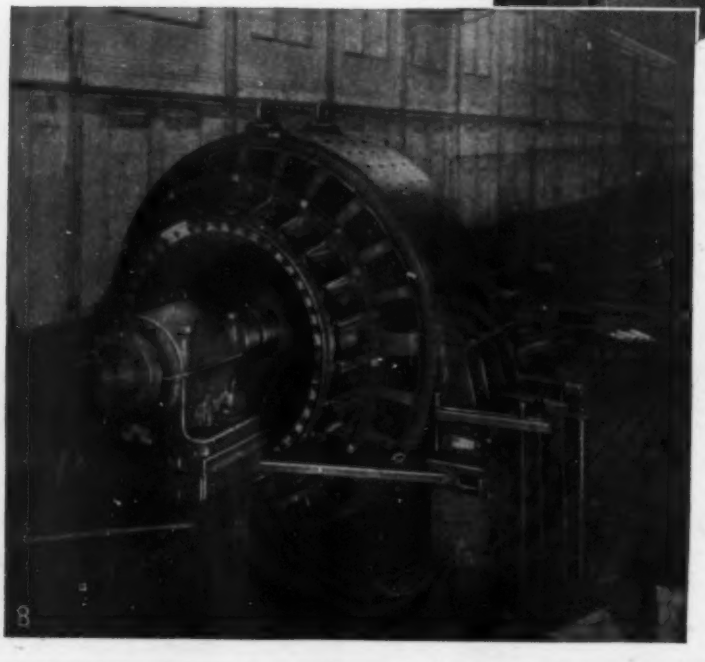


First Operation—The 1,000-ton crimping press forms the end of a slab by pressing it between dies, which impart the required curvature, thus avoiding a straight end after the bending operation. The crimping press is mounted on roller-bearing trunnions, so that it may swing with the slab rather than raise it from the rolls. Twin hydraulic cylinders are provided for adjusting to different heights

From Nine-Inch Slab to Welded Motor Frame . . . .

Second Operation—After the ends have been crimped, the slab is turned on edge and entered into the bending rolls, which consist of two rolls on stationary axes and one screw-down roll for applying pressure. A 75-hp. motor drives the stationary rolls, whereas the screw-down roll is idler driven. A 30-hp. motor adjusts the pressure on the slab

Two of the halves shown in Fig. 3 are bolted together to form the frame illustrated at the right. The method of welding on the feet with their reinforcing plates is clearly shown. The entire structure is built up from bars, plates and slabs, all standard steel mill products, and has greater strength than a steel casting, besides having better electrical characteristics



At left, the completed motor ready for test. Good appearance, record production time, and accurate manufacture are natural consequents of fabricated construction. Pattern costs and the possibility of casting failures are entirely done away with

Flexibility is the really significant point in connection with the apparatus described above. Motor and generator frames are its "bread and butter" items, and turbine housings may be included, but other work requiring the forming of heavy slabs in the sizes indicated can be done expeditiously and with certain results

//

· BOOK · REVIEWS ·

WORK ROUTING IN PRODUCTION. *By John Younger. Professor of Industrial Engineering, Ohio State University. One hundred eight 5½x8¾-in. pages. Indexed. Published by Ronald Press Company, 15 East 26th St., New York, N. Y. Price $2.50.*

HERE is a book dealing solely with the functions of work routing, scheduling, and dispatching. After many volumes on plant management and industrial engineering, touching many sides of these subjects but thoroughly analyzing none, it is refreshing to find an author who confines himself to a well defined portion of this field. Too many engineering works lack that conciseness of thought and expression which one has a right to expect from technically trained men. Professor Younger avoids this common fault and presents his subject briefly and specifically.

This volume is primarily a textbook treating the subject of work rounting and allied functions in an elementary manner. Problem questions appear after most chapters and at the end of the book. Familiarity with modern shop practice is shown by the selection of up-to-date machine operations to exemplify methods of routing. The illustrations nicely fit the text.

The approach to the study of the problems of management should be facilitated by the presentation of specific analyses rather than broad generalities. Adherence to this principle makes Professor Younger's book a step in the right direction.

*

FACTORY ORGANIZATION AND MANAGEMENT. *By Ralph Currier Davis. Four hundred forty pages, 5¾x9-in. Indexed. Published by Harper & Brothers, 49 East 33rd St., New York, N. Y. Price $5.00.*

DESIGNED for the student of industrial management and the junior executive, so the author states in his preface, this work makes available a comprehensive textbook of standard industrial practice. Data gathered from a wide range of sources is included, methodically presented. Those chapters dealing with material control are especially well conceived.

The general structure of similar works on the same subject is followed, perhaps too closely. The economic development of man from the stone age through Arkwright, Hargreave, and down to Frederick W. Taylor forms a familiar opening chapter. Conventional treatment is the rule throughout the subsequent text.

The experienced industrial executive or advanced student of management may not find ideas to improve his present practice or to provide a new angle. Perhaps this is asking too much, since the author has undertaken an introduction to the field of management rather than an advance in its technique.

Elementary in nature, but on the whole well selected, the line cuts illustrate chiefly standard industrial forms. Not quite so well balanced are the plates, as exemplified by the disproportionate number appearing on plant lighting compared to this subject's treatment in the text.

PICKLING OF IRON AND STEEL. *By Wallace G. Imhoff. One hundred ninety-six 6x9-in. pages. Cloth board covers. Illustrated. Indexed. Published by The Penton Publishing Co., Cleveland, Ohio. Price $5.15.*

THIS book covers many phases of pickling room practice, construction of pickling equipment, and maintenance. It is written in a manner that will appeal to practical picklers in the sheet, tin plate, strip, pipe, wire, seamless tube, enameling, foundry, galvanizing, and lead-coating industries. The author prepared the treatise after five years in research work at the Mellon Institute of Industrial Research, University of Pittsburgh, investigating pickling and galvanizing phenomena.

Much of the text is based also on practical experience obtained in plant pickling departments and on information compiled from interviews with men engaged in the work. Because of its practical character, the book is more useful for the man in the plant than for the research laboratory worker. One of the valuable parts of the book is the complete bibliography, covering 35 pages, of pickling articles and books.

*

ARITHMETIC OF ELECTRICITY. *By T. O'Conor Sloane. Two hundred thirty pages, 5x7 in. Cloth board covers. Indexed. Published by the Norman W. Henley Publishing Company, 2 West 45th St., New York, N. Y. Price $1.50.*

THIS clever little book is now appearing in its twenty-third revised edition. It consists of a simple development of the laws of electrical computation, and the placement of these into a series of rules involving only ordinary arithmetic.

Of course, the relations of the units as originally deduced by higher mathematics are not ignored, but the conclusions are taken, and constants have been worked out so that in the figuring of any ordinary problem no recourse to algebra or higher mathematics is needed. There are 110 rules given in the book, covering such matters as resistance, conductance, work, batteries, magnets, inductance, heating, and electric units. Examples are given after each rule. The book makes a handy quick reference for anyone having to handle occasional electrical problems.

*

FACTORS TO CONSIDER IN WORKING OUT MERGERS—Six major factors to be considered by the participants in any merger movement, and other questions which may or may not be important, depending upon the particular case, are analyzed in a 32-page booklet issued by Ernst & Ernst, public accountants. The booklet is a reprint of a paper presented by A. D. Berning, partner of the firm, at the recent convention of the American Management Association in Detroit.

The six basic questions that apply to all business consolidations, as given by the booklet, are: (1) economic and legal soundness, (2) management, (3) financial position, (4) earning power, (5) formula or plan of merger, (6) launching the merged business. Various aspects of mergers are gone into in great detail, and much of the material should be of interest and value to executives of concerns, whether or not the concern is involved in a merger. Copies may be obtained from any office of Ernst & Ernst.

EXECUTIVE · FORUM

Is the Customer Always Right?

FRED EVANS, sales manager of the Planet Engine Company, had been away for the best part of a month personally supervising the spring campaign of his force. Business was picking up, and his men in the field were responding nobly to his demands for increased activity. On the whole, Evans felt quite satisfied with himself and the world in general as he strolled into the shop to determine the progress of several orders he had closed.

As he passed the works manager's office, a stentorian voice rang out, "Hi there, young fellow, I want to see you."

Evans entered the office and greeted Al Kendall, Planet's works manager. "With a loud speaker like that, I should think you could dispense with the shop auto call system."

"Don't try to divert my attention with any salesman's wisecracks," returned Kendall goodnaturedly. "Do you remember that order for the Hillside Shipyard?"

"Don't tell me you dropped it off a crane or that it was lost in transit," suggested Evans.

"No, we delivered it all right," Kendall assured, "but I don't know which is worse—having you hound us about it here or having those shipyard fellows wiring every day since it landed there."

"Don't they like your handiwork?" inquired Evans innocently.

"They don't like anyone's work—mine or the other fellow's. Don't pretend to be so unconcerned about it—you know that crowd as well as I do—they're chronic kickers. They always find fault with something in order to get a little more than they pay for. I've had two men up there three times now, and frankly I'm getting tired of it. This extra service is eating up all our profits."

"I know they are a pretty tough bunch to deal with," agreed Evans. "Just what is wrong now?"

"Not a thing as far as our part of the job is concerned," stated Kendall emphatically. "In the first place they set up the machine on a green concrete foundation. When they couldn't get it lined up, they blamed the machine and hollered for us. Then they claimed the valve slide wasn't square and wanted a man to scrape it in. Finally we got a letter by air mail saying the finish was marred, and we had to repaint practically the whole machine. Now you know what a sweet nature I have, but these people are going to far. One more unreasonable complaint, and I'll tell them where to get off."

Evans reminded, "Remember the customer is always right."

"Within reasonable limits—yes; beyond that—no," asserted Kendall. "Like everyone else, we're in business to make a profit. It just isn't good sense to let that Hillside crowd stampede us into setting up and redecorating that machine."

"Basically and even theoretically you're 100 per cent correct," admitted Evans, "but if you followed me on one of my swings about the country, you'd discover that the age of competition has arrived. No, we can't tell the customer where to get off. If we don't put up with his little foibles, he'll find someone who will."

What Do You Think About This Executive Problem?

Unfortunately there are some people who, when they make a purchase, are not happy unless they can work the seller for something extra in the way of service. This does not include the customers who merit legitimate or agreed-upon attention, but the ones who seem to delight in imposing upon those from whom they buy.

Should a manufacturer meekly submit to this unfair practice? Or protest against it? Contributions discussing this question, which are accepted by *American Machinist*, will be paid for.

DISCUSSION

OF PREVIOUS PROBLEMS

To Whom Should the Chief Inspector Report?

When our inspection department was organized, we were instructed by the manager that it would be a separate and distinct entity from the rest of the factory organization; also, that we were to consider ourselves the customers' representatives. Could these instructions be successfully carried out, if we were to report items of inferior workmanship and defective materials to a general superintendent or chief engineer, who are usually primarily responsible for meeting a shipping schedule? Our answer is an emphatic "No." When quantity and quality are placed under the same supervision, it is always quality which receives the least consideration. Therefore, the value of an inspection department to any organization will largely depend upon to whom it finally reports. If to one whose responsibility covers sales activities—fine, as inspection and sales are closely related.

Our factory organization is composed of three divisions, wood, steel, and iron. The inspection line of authority and responsibility begins at the process inspector, then the department chief, the chief of the division, then the superintendent of inspection, and finally the manager.

—O. M. DUNTON,
Superintendent of Inspection
American Seating Company.

Equipment Replacement in Slack Periods

While a slack period is not the right period for enlarging the plant unless a very busy time is quite clearly in sight, it is certainly the very best time for taking stock of the assets and the replacing obsolete plant of modern equipment. We are used, nowadays, to remarkably rapid reorganizations of mass production plants and to miracles in the rapid erection of steel frame buildings, but the speed has to be paid for in more ways than one. For this reason, it is possible to get much better value by modernizing a plant at a more leisurely pace during a slack period. Quite apart from lower prices and better deliveries, the quality of a plant so modernized is usually higher than one produced during rush periods.

By spending money during a slack period, employment is provided just when it is most necessary, and each organization which shows confidence in its own soundness by preparing for better times is doing its bit towards raising public confidence and so bringing about a general improvement in business. Such a policy is, in itself, a benefit to any community. —H. JAMES,
Birmingham, England.

Who Should Do the Estimating?

Most certainly he should be a bona fide engineer and not a mere copyist. The estimator is preferably a man who has had both shop and drawing office experience and one who keeps intelligently in touch with progress in all departments. He should co-operate closely with his colleagues in both shop and office.

The writer most certainly considers that a technical man should be entrusted with the work of estimating, but that he should also be given the run of the works, so that costs will be closely related to actual practice. While others will assist in giving him the data he needs, his will be the sole responsibility for the accuracy of the work of his department. —N. ROWLAND,
Stafford, England.

Making a Manager Out of a Foreman

The system of allotting each foreman a certain sum every month on which to run his department, and paying him a bonus if he comes within the allotment, has a great advantage. It creates a powerful inducement to the exercise of the foreman's ability of economizing, by the offer to him of a definite personal gain. It definitely unifies his interests with those of the management, and insures his utmost co-operation.

To achieve the best results, the bonus should be made to increase with the amount of the allotment that is saved. Also it should be designed to depend on the quality and quantity of production, so that there shall be no tendency to sacrifice either to reduce costs. For instance, a bonus on the amount of coal saved may tend toward bad air remaining in the factory, to avoid the cost of heating fresh air, unless an adequate means of checking it is devised. Vitiated air diminishes the quality and quantity of production.

The management by determining the allotment still retains control. From one point of view it has greater control by this system; it has a much more powerful draw on the abilities of the foremen, and also a better knowledge of them. —JOHN J. WOFFINGTON,
Leamington Spa, England.

Should Estimates Be Given Operatives?

There has been a pronounced tendency in the past to keep all information relating to costs and estimates, and their relation to selling prices, away from the operatives. This is based on the fear that the individual operative could not reconcile the amount, he received for performing a certain piece of work, with the amount paid by the ultimate consumer.

There has been so much said and written during the last ten years about overhead, depreciation, selling costs, and other items, that many an operative wonders how his firm manages to keep out of bankruptcy. This attitude plus the

higher wage rates now paid have made him an ally. There is a certain satisfaction in being able to beat the time allowed by the estimator which may be caused by a genuine desire to help, a chance to show up one of the higher-ups, or an opportunity to win recognition as a step towards future promotion.

At our plant, on jobs of an unusual nature or of large size, our foremen assist in preparing the estimates, and all the manufacturing details are worked out in advance before quoting. After receiving the order, the individual operatives are advised of the time allowed on their part. They know that suggestions are welcome and do not hesitate to make them. Ingenuity and originality on their part is brought to the attention of one of the higher officials at the plant and rewarded.

—F. L. INGLERIGHT, *Superintendent, Bradford Motor Works.*

Who Should Control Routing?

Generally speaking, the engineer in charge of the routing should be responsible to the works manager. To him he should furnish daily or bi-weekly reports, covering work in process, deliveries made, reasons for delays, steps taken to correct conditions retarding production, and all other information bearing upon the subject of deliveries. By checking these reports against the delivery schedule, the works manager is at all times able to supervise the production situation, and cause such action to be taken as the conditions may call for.

The trend of present-day management certainly is towards functional control, and the best results are not obtained in a one-man shop. But after all, every organization must have a responsible head who, receiving reports from his chief lieutenants, can at all times review the entire situation. Functional control eliminates the old-time managers, who are their own production engineers, chief inspectors, head store-keepers, and chief engineers. —E. P. CLAUS.

Should Price or Payroll Be Cut?

The regular products of a machine tool shop must take care of the normal overhead, or burden, at all times. During slack periods it is important that additional work be taken into the shop to keep the men and equipment working, and to hold the organization together. Unless such steps are taken the burden will rise very rapidly and materially. But to get such work you must figure a lower overhead rate than carried on your regular lines, otherwise you cannot hope to compete with the jobbing shops in better position, from a cost standpoint, to handle this work.

Plant executives and accountants must get together on a mutual basis of understanding and think these problems out, not from a production or accounting viewpoint alone, but from the standpoint of the greatest good to the entire business. To take care of this particular problem in our plant we have worked out two sets of burden rates for our work: one for the regular product, and another to apply to this special outside work.

We include every item of expense in determining the normal rates of burden that apply to our regular lines. For the outside work we apply a rate that has been consistently determined after considering all items of expense and their application to the work to be done. There are many items of expense applicable only to the regular products of a plant, such as:

Engineering
Patterns and drawings
Special and costly tools, jigs and fixtures
Stock room overhead
Taxes, insurance, interest on inventories
Spoilage
Servicing of customers' machines
Certain classes of indirect labor
Certain classes of administrative expense.

When burden rates for special work are so determined, they are consistently lower than the regular shop rates and likewise consistently correct for this special class of work. It is very evident that expenses of the nature enumerated above are incurred for the express benefit of the regular products of the business only. Therefore the special work should not be burdened with any portion of it.

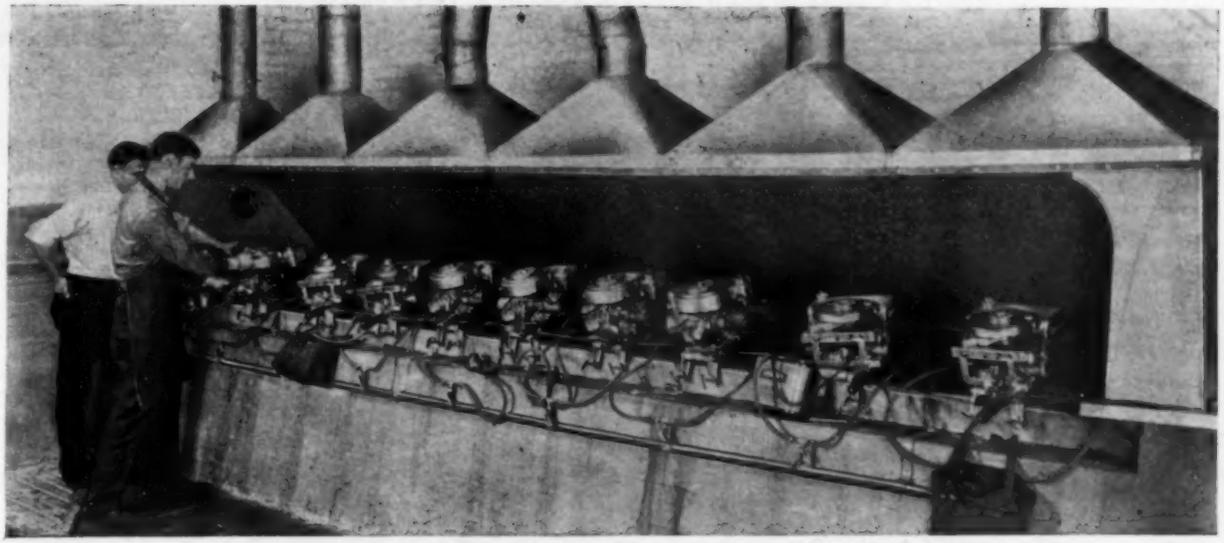
—THOS. B. FRANK, *Treasurer, Cincinnati Planer Company.*

Should Special Work Be Segregated?

If there is as much special work in any organization as is mentioned in the case presented, it should absolutely be segregated. Ours is a concern where the handling of miscellaneous special work is a big problem; the work is done and shipped on the dates specified without interfering with the production schedule by this method. It was found here that no extra cost was entailed, except the moving and setting up of machinery in starting a repair department, as the machines were gathered from all over the shop. And what shop has not some dead wood that is better earning its salt in this way?

I was previously connected with the cotton machine industry, and while there employed, had a wonderful chance to see this plan worked out in a big way. A department was set aside for repairs, the machinery was brought in from all over the shop, and all put in charge of a live, competent foreman. When a repair order was received, it was sent to this department, the men in which had no production worries. The figures at the end of the first year showed an enormous gain over the old method of placing the work through the regular channels, and the production schedules were not bothered.

—CHARLES R. WHITEHOUSE, *Chief Time Study, The Holtzer-Cabot Electric Co.*



Each motor is tank tested under conditions closely simulating actual service.

Insight Into Outboards

Describing a less well-known branch of automotive production, and restating certain management principles that have application in other branches of the metal-working industry

By H. B. KILROE

Factory Manager
Outboard Motors Corporation

AUTOMOTIVE production is notoriously seasonal despite widening world markets; the production of outboard motors is even more so. In fact this is one of the chief problems facing manufacturers of such units. Some companies have made attempts to take on other lines, but this business is usually short lived because the side line is neglected during the busy period for the basic products of the plant. Development of sales in southern waters in winter and abroad at all times of the year seems to be the final solution; that and the development of an organization flexible as to personnel and equipment.

The Outboard Motors Corporation plant in Milwaukee represents the physical merger of three plants making Lockwood, Elto, and Evinrude motors, the last being the nucleus company of the group. This meant the enlargement of the parent plant and the consolidation of the best of the equipment of all three. It also meant that the combined experiences of all three units would be summoned to work out as ideal an organization as possible, consistent with all the problems pertaining to this class of manufacture.

Including two modified units with self-starters, eleven different models are made in the plant, many of them radically different and varying from a 2¾-hp. motor weighing 29 lb. to a 35-hp., four-cylinder unit weighing 120 lb. For this reason, tooling is of the simplest type, adapted to standard equipment. Engine lathes, turret lathes, milling machines, cylindrical grinders, and single-spindle drill presses predominate.

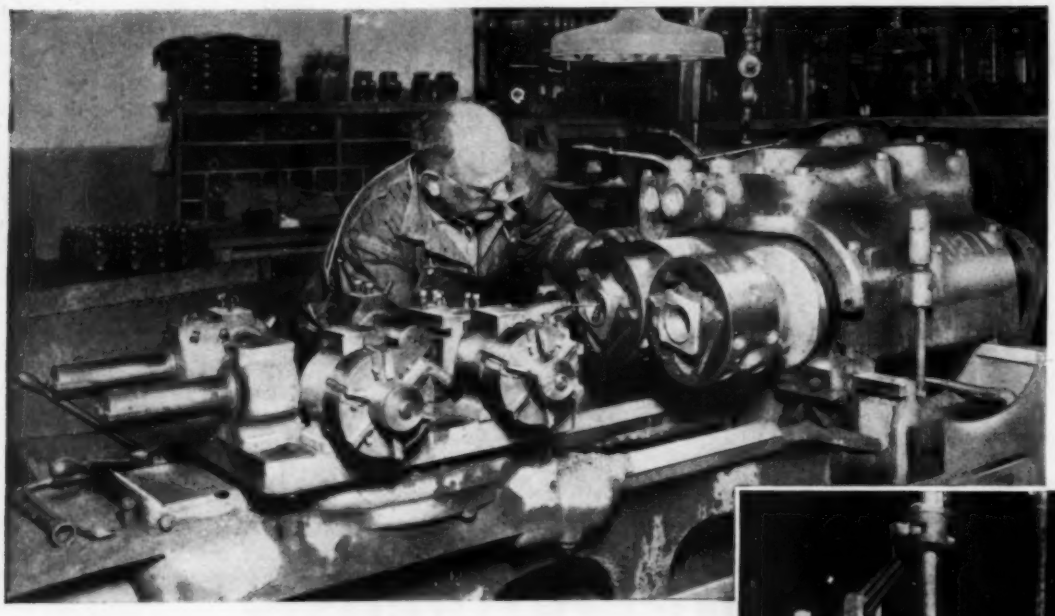
For such parts as crankshafts and pistons, automatic lathes are employed, and parts are run through in large lots. Experimental orders are run through in units of 50 to 100, the purpose being to familiarize the combined staff with operations and tooling.

In planning production, an attempt is made to gage a year's sales requirements in advance. All sales are made through distributors located throughout the country. When possible, these representatives are brought to the shop in early January for conferences on sales quotas. By totaling the orders from distributors, the sales department is enabled to set total yearly sales, which are later broken down into monthly manufacturing requirements. From these figures the production schedules are prepared for two months in advance; that is, in the early part of each month the requirements are gaged for the succeeding two months. Plant equipment is planned on the basis of production analysis for the ensuing 18 months. Material, however, is bought on a 60-day basis.

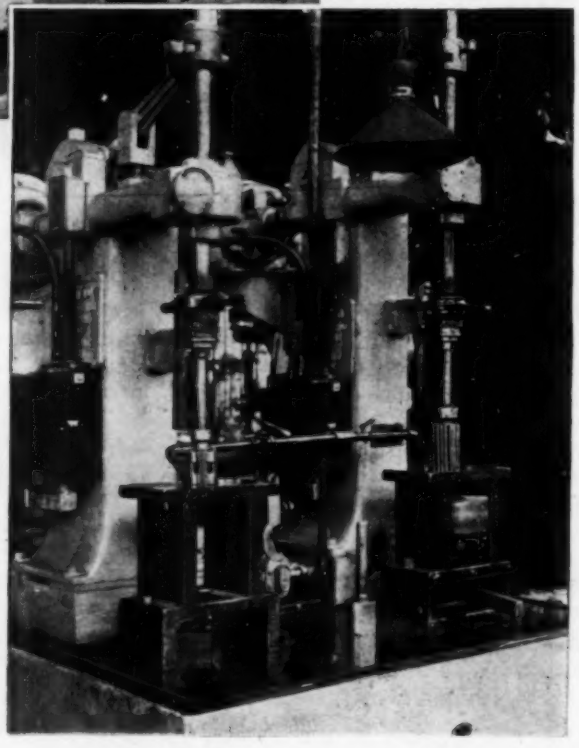
Although casting requirements, for example, are estimated for a period up to two months in advance, orders are placed for deliveries at weekly intervals.

The fact that, with a few exceptions, all firms supplying castings are local makes it possible to control shipments of raw materials very closely. This also applies to inspection and rejection of parts. One forging supplier, for instance, is located immediately adjacent and is almost a part of the works. Because of this condition, considerable flexibility is allowed in the production schedule. To cite a specific example: In the month of January orders for 1,000 more motors than had been planned were received for almost immediate shipment. Only because of the close contacts with the foundry and forge shops was the necessary co-operation obtained in realizing the quick delivery necessary to turn out these parts.

Before the consolidation of the three plants, the



Cast-iron cylinder blocks are bored, reamed, and faced in pairs in this duplex turret lathe, carrying pot chucks



All cylinders are honed after the wet grinding operation. In these units the hones are reciprocated mechanically

nucleus plant, known as the Evinrude division, was equipped to turn out a peak quantity of 200 motors a day with a maximum personnel of 450 men. With the enlarged plant, this capacity has been doubled, necessitating about double the number of shop employees at capacity. During the dull period, about 300 persons can be kept busy, which represents a fair smoothing out of the seasonal peaks. One way this is accomplished is by building parts for stock and for service. Crankshafts, for example, are always being put through the plant. Of course a nucleus staff must always be maintained, consisting in general of a foreman and an understudy in each of the 21 different departments of the works.

THE question of tooling is a problem in itself. Today, including the units with self-starters, there are 11 different models in production, and three separate makes. Tooling is different for each, and, in order to avoid confusion, indentification is effected by colors and by bands. In other words, all tools marked with orange, for example, would be for the Lockwood line, and the number of stripes in the tool would indicate the particular model of that line.

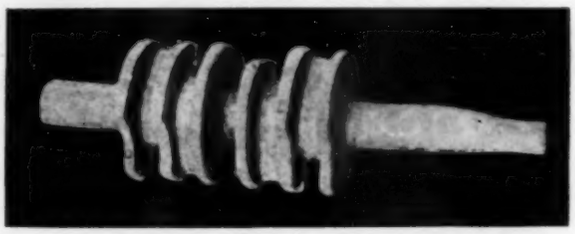
The plant is divided into 21 departments, and with the exception of the plating, polishing, heat-treating, inspection, and assembly divisions, each department is segregated by product. That is, all pistons are machined in one department, cylinders in another, gear housings in a third, and the like. Each of these departments is a separate shop in itself, and no attempt is made to transfer work from one to the other. Each has its own inspection bench where a 100 per cent inspection is given the product before it moves toward the assembly storage bins.

In fact, inspection plays a major part in the manufacture of outboard motors. It begins right at the shipping door, since many semi-finished parts are purchased outside, including all iron and aluminum castings, bronze and steel forgings, ball and roller bearings, storage batteries, carburetors, gasoline tanks, and gears. To give an idea of the nature of the parts, a typical motor may be described—the opposed twin, since it is the common type. The cylinders are cast iron bolted to an aluminum crankcase. The pistons are also of aluminum; the connecting rods, steel forgings, except in one motor the rods of which are bronze. The magneto flywheel is aluminum with laminated iron cores, the midsection of the housing is aluminum, as well as the lower portion including the propeller housing and the underwater exhaust. Necessarily, the crankshaft is a heat-treated forging, driving a vertical driveshaft through a key. Hardened bevel gears transmit the rotation at right angles to the propeller shaft, which is of steel. Propellers are either aluminum or bronze, depending upon their size.

Castings entering the shop are given a visual inspection for blow-holes and general appearance and are checked against the blueprint for distortion. Castings coming

from new patterns are given a more thorough check by scribing the machined dimensions on a surface suitably prepared by painting, using black in the case of aluminum castings. A blueprint marked with the checked dimensions serves as a record for this initial inspection. A certain percentage of cylinder castings is tested for porosity under air pressure in water. Later, these castings receive a 100 per cent air test after machining so that only the poor appearing ones need be tested in the initial inspection. Forgings are tested for straightness, if they be crankshafts, and occasionally are fractured and the microstructure examined. With certain of the aluminum castings, test bars are included. These are pulled for a check on the tensile properties. In the case of trouble, X-ray analysis of castings is sometimes made at the plant of the supplier in order to detect major defects.

PROCESS inspection follows each machining operation, and a very careful inspection takes place during assembly. In the inspection department is a bench with labeled compartments in which are placed on exhibit all work rejected in the various departments. Twice a week the foremen gather around to view the sad remains and to learn a lesson in how to avoid future spoiled work. Another incentive to reduce scrap and rejections is obtained by charts placed over every inspection bench in each department. These charts are kept up to date weekly, showing by plotted curves the relation of passed parts to rejected and scrap pieces. Not all rejected pieces are scrap, of course, as some may be recovered.



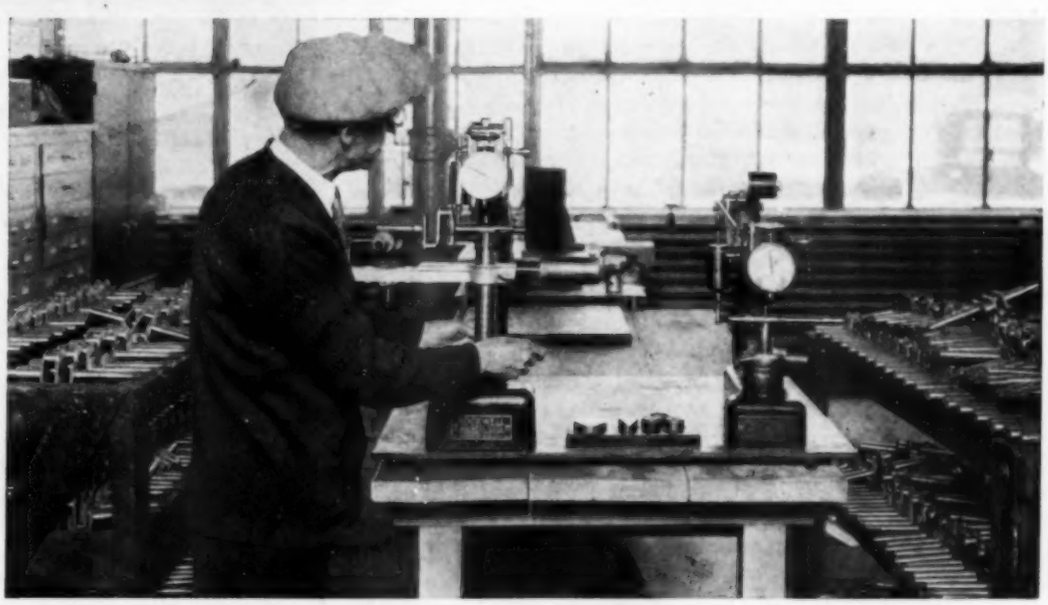
A number of operations, including drilling, milling, turning, and grinding are necessary to finish this rough forging of a four-throw crankshaft

As an example of the typical production problems in outboard motors, the manufacture of cylinders may be described, since good cylinders are vital to good motors. Castings are carefully examined visually for defects upon entering the plant, as has been mentioned, and, if there is any evidence of porosity, are air tested under water with the aid of fixtures carrying rubber seals for the ports. After the first boring operation the castings are allowed to set before being rebored and ground. One method of boring and facing a pair of cylinders employs a duplex flat turret lathe. Other cylinders are finished in standard turret lathes, pot-type fixtures being used to hold them.

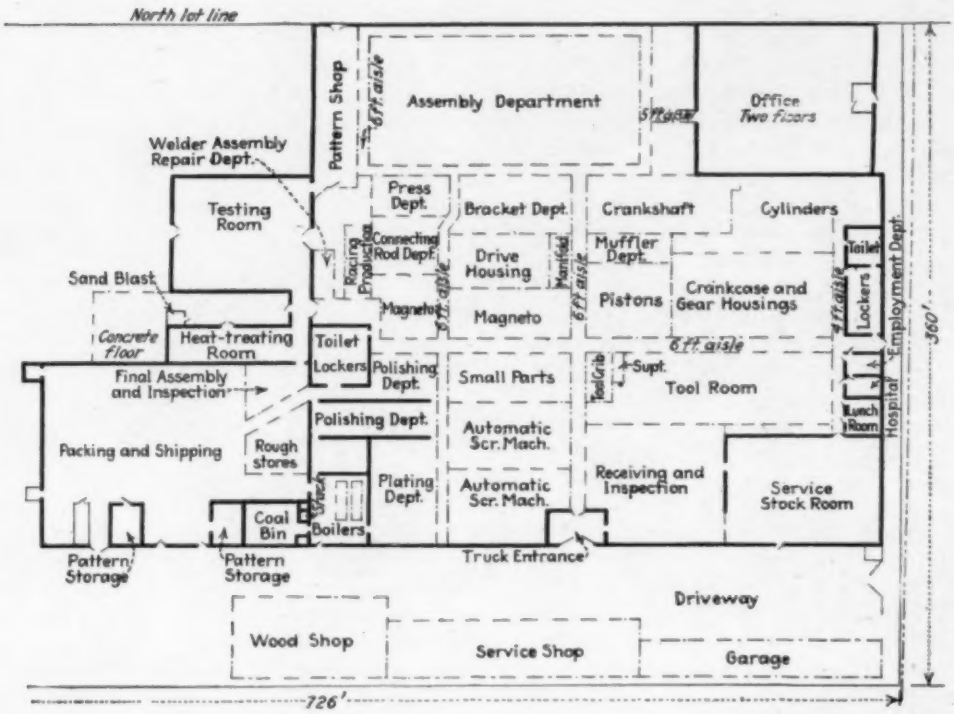
After the reboring operation, the cylinders are wet ground. Wet grinding was chosen to keep the casting cool and the cylinder true. In line with modern automotive practice, honing follows, a simple form of box fixture being used to hold the cylinders. These particular units are reciprocated automatically, although some single-spindle machines, having manually reciprocated spindles, are also employed. Drilling and tapping remain to be done, as well as milling the valve ports, which must be located accurately in a 2-cycle engine of this type.

Piston operations are even simpler. Turning and grooving are done in automatic lathes, grinding on centerless machines. The boring and reaming of the wrist pin hole is the only other operation.

CRANKSHAFTS involve several varied operations somewhat different from usual automotive practice, particularly the four-throw crankshaft for the so-called "Quad" dual-opposed cylinder engine. Because of boring difficulties, it is necessary to leave pear-shaped sections between the checks, and the pins are developed from the upper or narrower section of the pear. To do this, holes are drilled through the web, and the metal in the central part is removed by milling or sawing to this drilled hole. This leaves the pin parabolic in shape with one flat side. It must be rough- and finish-turned in automatic lathes before it is ready for heat-treatment,



Finished crankshafts are given a 100 per cent Rockwell inspection at three or more points



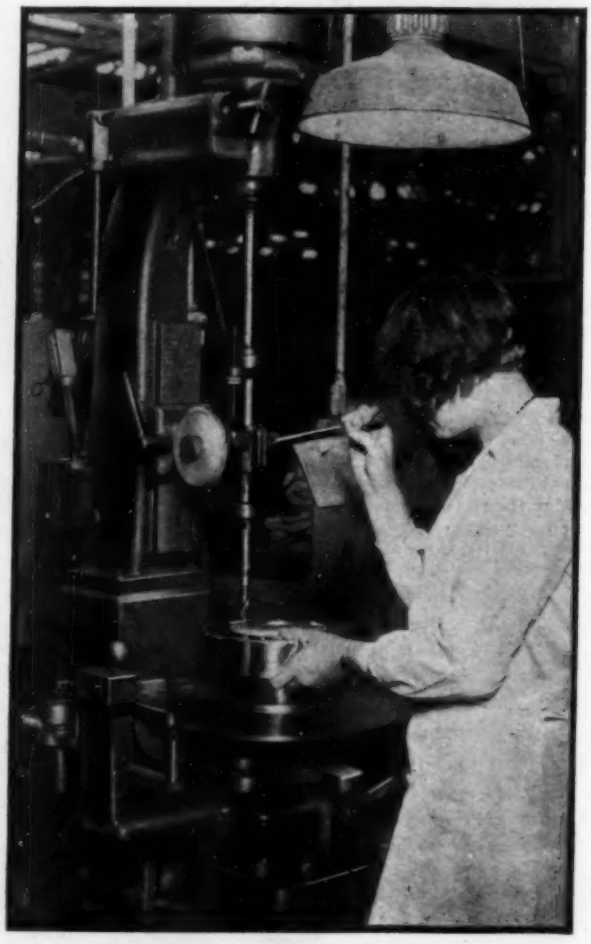
Floor plan of the Outboard Motors Corporation plant, showing the 21 manufacturing divisions, each operating as a unit

consisting of casehardening the pins and bearing seats.

Heavy copper is used on the cheeks to prevent absorption of the carburizing compound and thus keep them soft. The shafts are carburized to a depth of 0.060 in., after which they are given a preliminary straightening before heat-treatment so that final straightening, when the shafts are in hardened condition, is very small; hence no high stresses are developed. The process of carburizing gives a glass-hard surface for minimum bearing wear, at the same time leaving the core soft and tough. After heat-treatment, the pins and bearings are ground, then the shaft is given a 100 per cent inspection, including Rockwell hardnesss readings at three or more points.

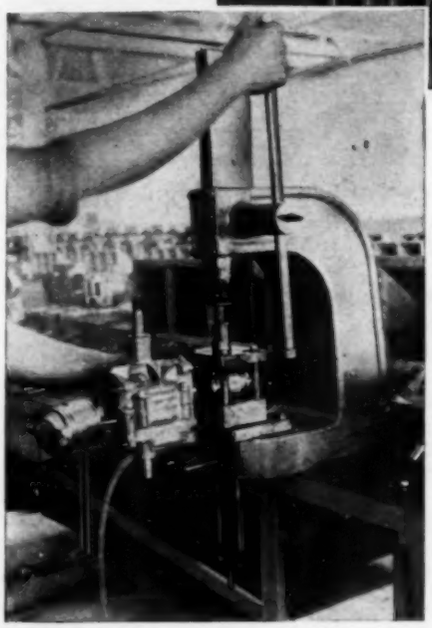
CONNECTING rods are put through much the same heat-treatment operations as crankshafts. In most models a roller bearing with split cage is used. On account of weight and space limitations the outer race must be integral with the connecting rod. This bearing surface is therefore casehardened and ground, but the remainder of the rod is left untreated.

Another problem somewhat out of the run of ordinary automotive production is that of machining the aluminum gear housings. For appearance and to cut down skin friction, the housings are polished. At first thought it would seem that this polishing would be the final operation. However, on account of the high coefficient of expansion of aluminum and its consequent susceptibility to warpage and twist under local heat, even of that created by the polishing operation, polishing comes first, and boring, drilling, and reaming follow. Otherwise, parts of the casting would be likely to "walk" and some of the remaining components bind after expensive machining operations had been performed.



Light operations, such as balancing aluminum magneto-flywheel housings, are performed by girls

Assembly of the power head takes place progressively along benches. One man inspects every unit between each stage of assembly



By hand press, the piston pins and pistons are assembled to the rods, which are already in place in the crankcase

Assembly of the motor units, or power heads as they are called, is progressive along benches. Connecting rods are straightened in a fixture that also checks the alignment. The units are then matched for weight in pairs on a scale. Roller bearings with split cages are segregated by size in tenths of thousands and are assembled in the rods and on the crank pins. Main bearing support for the crankshaft is obtained by the use of a ball bearing on one side and a cylindrical roller bearing on the other, the inner races of each having a press fit on the shaft and the outer races being pressed into aluminum crank case housings. Pistons are weighed in pairs and the pins are assembled in hand presses. Because the rings are already in place, it is necessary to compress them with a special tool while the cylinder blocks are slipped over the pistons and are bolted to the crank case. The last operation in the line is to assemble the gasoline tank and connect up the piping to the carburetor which has previously been assembled as a unit. Between each assembly group of operations, process inspection takes place. One inspector divides his time between all stations and watches out particularly for running fits and clearances, reversal of parts, and the like.

At the end of the assembly lines the power heads meet a line of sub-assemblies mounted on horses in groups of four. These sub-assemblies consist of the lower part of the units including the drive shaft column, gear housing and propeller unit, all assembled at adjacent benches. Each horse is mounted on a caster base which is slid along the concrete floor between metal guide rails.

When completely assembled, the units on horses are pushed to the far end of the assembly room where they await test and adjustment. Special tanks are used for testing motors under their own power, the water chamber being so designed as to take care of the conflicting stream lines created by as many as ten motors placed on 3-ft. centers. Sheet-metal hoods remove all exhaust fumes. After this running test, which lasts approximately two hours, the motor is turned over to the inspection department. When it has cooled to normal temperature, the inspection department then tries out each motor, one at a time, on a special tank called the final inspection tank. Here the motor is started according to instructions just as an owner would start the motor on his boat. When the motor passes this test it is then cleaned and given a rigid visual inspection before it is sent to the shipping room and crated for shipment.

Two Drawers in Benches—*Discussion*

By J. T. Towlson
London, England

WE HAVE partially solved the drawer problem by pairing the workers, a day man and a night man that like and trust one other. If the space on a continuous bench is adequately economized, I doubt that there would be sufficient room for duplicate drawers, as suggested by John R. Godfrey on page 690, Vol. 71 of the *American Machinist*.

Whether there would be or not, seems to me unimportant when contrasted with some of the other problems affecting the relations of the day and night forces. For instance, during the day a gage or tool has been sent back for repairs, or mislaid. At a certain point in his work the night man looks for it, and it cannot be found. The toolmakers have all gone home, and it is necessary to shift the man to another job or make a substitute tool. To cap the climax, the day man, if he cannot readily find the tool, blames its loss on the night man. Some place to keep such tools and some method of keeping track of them is important.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

THE · FOREMAN'S

SPRING SONG

"MORNING, Ed. Isn't this a peach of a day?" said Al, as the two met at Ed's gate.

"I'll say it is. But tell me something, Al."

"Shoot! I can answer anything on a day like this."

"Well, tell me why it is that just about this time of the year all my men begin to hint, or ask outright for a raise?"

"That's easy! It's the same thing that makes unmarried girls think June is a lovely month for a bridal trip, and that makes married women want to move the furniture around. It causes men to think they need outdoor work, it makes the feathers on a robin's breast turn red, and it makes little dogs think they are big dogs. It's just that the sap is beginning to flow."

"Yes, I've noticed, too, that some of the saps in my department get restless about this time, and flow to other jobs. It looks like I am going to lose some more of them before long."

"Why, what is the particular trouble?"

"That's the trouble, it's nothing in particular. You know, when I put in those automatics I had to have a man to tool them up. I did not want a regular toolmaker, but I did want a man a little better than our production mechanics; so I hired one out of another job and paid him more than the maximum rate. I don't know how it got around, but it did, and now my best men are kicking. The way I look at it I could only recommend the same rate for one or two of them anyway, and the rest would still kick. I don't know what to do."

"Write it down in your book, big boy, that no matter how much pay a man receives, it is never enough in the spring. Wanting an increase is very much a state of mind, and if a man does not think of it himself, his women folks remind him of what the family could do if father only earned as much as Mr. Blank."

"Maybe it is a state of mind, but how do you cure it in my particular case?"

"I had the same complaint when I hired a set-up man, and I got around it by threatening not to hire any more men above the rate."

"Threatened! That don't make sense, Al."

"Yes it does. I told them that when I had hired a sufficient number of men above the maximum rate, to justify it, I would recommend to Williams that the rate of the others be raised to correspond. Otherwise the rate would stand as it was."

"Did they swallow that?"

"Certainly, isn't it fair?"

"Suppose I suggest to Williams that I raise one man's pay for every outsider that I hire over the rate?"

"Who is going to pick out the man?"

"Is it possible under any conceivable plan to solve the pay increase question? Can it be reduced to a formula? To what extent are individual and collective demands for an increase a state of mind?

Foremen are invited to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

Why Conferences, Anyway?

IN A RECENT study by the American Management Association, out of 328 factories that answered a questionaire on "Supervisory or Foreman Training," 129 stated that they had such training. Eighty-six of these companies had meetings held by the foremen's superior officer, and 53 had meetings conducted by a staff man other than the foremen's superior. This goes to show that foremen's conferences should be conducted by experienced leaders and preferably by the foremen's superior officer who knows the problems of the factory in general and can guide the discussions along the proper lines. The average foreman is likely to see only his side of the story, and even if he is temporarily appointed chairman of the meeting, he still retains his limited viewpoint. The superintendent or staff man would see the real value of the problems presented for discussion and would help the foremen to get a general viewpoint as the final result of their discussion.

Another interesting thing came from the American Management Association questionnaire, that 84 companies who had foremen conference training used no written material for the foremen. These concerns developed their conferences along the lines of allowing the foremen to bring up their most troublesome problems and then letting the discussion take its own course. I believe that conferences should be run on a business basis whereby the foremen know in advance what they are going to discuss and have some written material given them which will help them to think straight on the subject before they go into the conference. This saves a lot of wasted time in listening to men talk about something they are not fully acquainted with, bringing up a lot of points they would never suggest if they had read some written material on this subject. Conferences should also start on time and end promptly, for the shop foreman runs his department on time and expects the foremen's conference to begin and close on the same basis.

—E. H. TINGLEY, *Secretary, National Association of Foremen.*

*

Mottoes in the Shop

POSTERS in the shop have done inestimable good. They have also, perhaps, done an equal amount of harm. As Al states, the average mechanic is a reasoning being; therefore it should be unnecessary for him to be constantly reminded to do this, or not to do that. A word of advice or instruction occasionally will do more good than any number of posters, more especially when the message they carry is frequently disregarded by the "higher-ups." Probably the most used poster is the "No Smoking" sign, yet most of us have seen some of the executives pass by, emitting cigar smoke like a locomotive.

The most harmful poster which the writer has seen was distributed by the city safety council for posting in the various shops. In addition to a few words of warning, it carried a life-size picture of a man's hand, blood-bespattered, and with two fingers missing, the jagged stumps being pictured with startling realism. The man who is afraid is doubly susceptible to accidents, and such a poster can only instill fear in a man's heart.

—R. H. KASPER, *Master Mechanic, Steel Heddle Manufacturing Company.*

*

Off With the Old, On With the New

ONE of the inherited traditions of industry, which appears to lack all logical foundation, is the glib assumption that the man in the shop is only interested in a steady job at good wages. The tradition usually goes further in that it is willing to admit that the office man naturally demands an interesting job and a reasonable opportunity to do things in addition. The reason for the continued acceptance of this false premise has always been a mystery to me.

The man in the shop is just as interested in good machine tools as the office man is in modern office equipment and modern methods. The longing to do things in the best manner possible, to try new set-ups that save time and money, is such a natural one that it is really an insult to a good shop man to attempt to prove or justify it.

The organization which hasn't yet discovered that the appearance of the shop end equipmen influences applicants, and that mortality in reporting for work after hiring is directly in ratio to this, is almost hopeless in this day and age. —BERNARD F. MCCORMACK.

*

Closing the Door to Late Comers

I HAD occasion, several years ago, to be held up by a long, slow freight which caused my late arrival at the plant. The checks were locked up, and I had to make the customary amends. Imagine my embarrassment in having to report to the clerk before going to work! The plant was a large one employing thousands. The system of encouraging promptness was very effective.

Contrasting with the above system was another, rather unique, in which the employer made no attempt to correct the fault of tardiness. In days of yore, when the merry liquid flowed in uninterrupted volume, it was my privilege to register my entry to the plant one hour later on Monday mornings. This was called "big-head morning," obviously well named. I appreciated the fact that a great number of men were just "one hour less drunk." Even then there were those who came in tardy.

In the former case the employer used corrective measures which were very effective in that they produced the incentive without the objectionable feature of creating

discussion is not limited to foremen. Letters accepted and published will be paid for

anger or dissatisfaction. Measures that are psychologically sound are lasting and constructive. The advocates of the "big-head" scheme were tolerant of a destructive error and gave their men more "rope."

Tardiness is a destructive element, costly to the employer, and eventuating in very expensive liabilities in the employee's reputation.

—J. HOMEWOOD, *Instructor, Chaffey Junior College.*

*

Keeping Machines on the Job

THE Maintenance man is a machinery doctor, and he should really be paid as Chinese doctors are reputed to be, for keeping the patient well rather than for curing him when he is ill. He should be a man who is cognizant of the value of "a stitch in time." The more time he spends in putting in stitches and the less in putting on large patches the more is he a maintenance man and the less a breakdown gang. Efficient maintenance involves the regular inspection of every machine and motor, and of all lineshafting and pulleys. A calendar should be drawn up giving approximate dates for the examination of each machine. An adequate supply of spare parts should be kept on hand. The inspection will show what parts will be required. The conditions in any particular plant will, in many cases, make it worth while to provide additional shear pegs or other "weakest link" devices by means of which machines, which usually fail due to an accident will fail at one of a number of predetermined points, the repair of which is comparatively simple.

The provision of a program will enable proper arrangements to be made well in advance for each machine to be released for inspection as required and for the replacement of parts by spares already in stock and ready for fitting. In the case of machines which can be moved complete, everything is greatly simplified by keeping a spare machine ready for use and dropping it into the place of a machine taken out for overhaul. A machine tool which is long past its first youth will often earn its keep in this way even though it is by no means as efficient as the machine which it temporarily replaces.

—H. J. BURNHAM, *Coventry, England.*

*

Who Shall Be Laid Off First?

WHEN it becomes necessary to lay off a number of men, there are other things to be considered besides the rating of a man's mechanical ability. It would not be good policy for the management to dictate to the foreman about what class of men to lay off, because the foreman knows his men better than the management does, and there may be reasons why certain men should or should not be laid off. For instance, he may have a good mechanic who is not reliable, one who lays off at critical times or who is always coming late.

On the contrary, he may have another man who, although not one of the best mechanics, has learned to perform certain operations as well as the best mechanic, and the foreman finds it a pleasure to work with him because he performs any job given him cheerfully.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Keeping Machines on the Job

IN THE majority of factories the world over, the maintenance man is always associated with breakdowns. It matters not whether the product be sugar, soap, or ships. It will be a great thing for industry in general when this standard is changed for that employed by the great transport companies, railways, and mercantile establishments, and especially their youngest brother, the airways. In none of these does the maintenance man wait for stoppage, but lives up to his name and maintains the efficiency of his allotted machines. His word is law, and if he says that a certain machine, engine, or whatever it may be, is nearing the danger line, it is sheer folly to attempt to carry on and attempt to get the last ounce out of it. In this case it amounts to life or death whether his word is respected or not. In ordinary production there is the same necessity, and if a little more attention were paid to the likelihood of machines breaking down, instead of waiting until they actually crock-out, fewer contracts would be broken.

—JAMES R. CORNELIUS, *Coventry, England.*

*

New Drills and Old Men

VARIOUS means are possible by which Bill, the driller, can be induced to operate the new machine. The motto "Might makes right" can be acted upon; namely, "do it or clear out." But this method of persuasion is fast dying out, and is adopted only by a minority of foremen. Wiser and better methods now answer the purpose. The average man is susceptible to reason, and likes a foreman who will use reason. For instance, why not frankly tell the man that his superior skill is necessary for the new and complicated machine, because a fresh man would probably smash something the first day? He will appreciate such recognition of his ability and see the force of it. Then again, an obstinate workman has some real or supposed grounds for his attitude. Have a quiet chat on the subject; meet the man fairly, assuring him of a square deal. Show him there is no ulterior motive, and that, though the superior machine may necessitate modification of prices, his usual earnings should increase rather than decrease. This will remove the chief obstacle, and the battle will be over without humiliation on either side.

It might at first appear that the driver, or direct actionist, comes off lighter than a diplomat, as regards mental wear and tear, but in reality he does not. The way of a "driver," like that of the transgressor, is hard. Though men are compelled to fear him, there is the danger that they may also hate him. Unpopularity is very nerve-wracking. There is no greater strain than to realize that one's workmen are also one's enemies. Sooner or later it will break a man up, one way or another.

—WILLIAM BRYCE, *Sheffield, England.*

* * * *

THE · NEXT · TOPIC

"Charity Work"

Co-operation in Vocational Education

By R. F. CAREY
Director, Wyomissing Trade School

The public school and the industrial plant alike recognize the need for effective vocational training. Their efforts can be made to yield maximum results if each will supplement the other's activities

VOCATIONAL education, just now, is very much in the public eye. The training of skilled workers has not nearly kept pace with the natural development of the country. The shortage thus created is intensified by an enormous expansion in a number of our mechanical industries, such as the automotive, radio, aeronautical, and domestic refrigeration, as well as by a marked increase in the activities of our non-mechanical industries. This shortage is further increased by the effects of restricted immigration and the long-standing tendency of American youth to seek white collar jobs. In this increasingly mechanical age of ours, there is no argument against the need of this sort of training, it being generally conceded that the main issues are who shall do it and how.

There are two major interests concerned in this matter of vocational education: industry and the public school. Let us interpret the term "industry" in the broadest possible sense, including all organized agencies operated for profit. These two interests should be considered both in relation to the boy in the public school who is being trained for industry and to the boy in industry who needs related instruction.

Not many years ago, all public school instruction centered about one single purpose, preparation for college. On this basis, about four-fifths of the pupils, who did not enter college, received a general education that fitted them for nothing in particular. To offset this obviously improper situation, training of a vocational nature was introduced into our secondary school curriculums. This instruction is given in carpentry, printing, machine tool operation, domestic science, dressmaking, etc., with the result that these students on or before graduation enter a trade of their own choosing with some very definite preparation for that trade.

For years, many of our mechanical industries have been training apprentices, giving them more or less broad practical experience. They have been teaching much of the how of things and but little of the why, due largely to the difficulty of giving this form of instruction amid the noise and bustle of a production department. Because of the lack of knowledge of why they did what they did, apprentices were handicapped when it came to filling positions of greater responsibility, and this lack is still felt by those who do not yet receive suitable related instruction. Not only is it difficult to give either practical or related instruction on the shop floor but the foreman, who is the logical man to do this, is not usually available nor is he fully qualified. He is too busy with his duties as foreman to pay very much attention to the apprentice, the lowest producer on the floor and therefore the one whose lowered production will be felt the least. If the boy needs instruction when the foreman is busy, a kindly workman may give him some indifferent help, or some joker may mislead him into a foolish error; otherwise, he must await the foreman's pleasure. The same is true when one job is done and another wanted; the apprentice waits. Even the foreman with the best of intentions, may not have the patience to spend much of his time in even the most necessary instruction on how to do a job, to say nothing of entering into any discussion of why it should be done in some particular way. Still worse, perhaps, is the fact that many foremen do not want apprentices. They have no great interest in the

perpetuation of the shop, much less the industry. Their duty from their viewpoint is to get out the required amount of production, and anything that interferes with that is regarded in an unfavorable light. A poor apprentice requires some of the foreman's time and therefore is an annoyance; a good apprentice is likely to be pestiferous. This feeling of the foreman toward the apprentice is especially true in the smaller shops. In the larger ones, where the management is broad and far-sighted, the foreman, reflecting the attitude of the management, may accept the apprentice but looks upon him largely as a necessary evil. Therefore the need of these boys in industry is for systematic instruction supplied by some agency outside of the production department.

THERE is an increasing desire on the part of public schools to extend their activities in this field of vocational education. At enormous cost, fine buildings with splendid equipment have been provided with a lavishness on the part of our school boards that a few years ago would have been considered scandalous. But is this wise and is it best? Production is the keystone of industry. The finest school building in the land, with the most modern equipment, together costing millions of dollars, has no adequate or regular flow of work on which to exercise its facilities and cannot therefore create an atmosphere of production. On the other hand, few industrial concerns can afford the luxury of a corporation school. Where they can, the results surely justify the expense. We must plan, therefore, for the smaller plant which, with few apprentices, must look elsewhere for a source of related instruction, which logically lies in the public school. I do not wish to be misunderstood in regard to the above statement about fine buildings and equipment. Education must be made attractive and interesting; whatever can be added to these inducements by setting up a stimulating atmosphere is worth the price. Again moderate expenditures for equipment are entirely justified on the basis that industries seldom, if ever, place boys under sixteen years of age on machine tools. Consequently the boys in the 9th, 10th, and possibly 11th grades, not having reached this age, should have an opportunity to learn something about machine tools.

In industry, we have vast laboratories of production which are equipped with the latest machinery, working at utmost efficiency in an atmosphere of production where the mechanics of the future can learn the trade of their choice under the same conditions that they will practice it. In the public schools, we have equally efficient facilities for giving the related instruction, fine buildings with splendid equipment and corps of teachers skilled in the art of imparting knowledge.

Why not get together? Let each factor recognize the inherent capabilities of the other as well as its own limitations, and assume that portion of the task which it can do best. Let industry concentrate on those matters pertaining to production, and the schools on those of related instruction.

Industry laments the weaknesses of the product of the public school, yet does little to assist in adding strength, nor do they make any very systematic attempt to attract the better boy. They take what comes along of its own accord and complain at the result. Why shouldn't they complain, for the better boy usually goes elsewhere? Still the experience of the few has demonstrated, beyond question, that the better boy can be attracted. One way to do this is through co-operation with the public schools. A few of our industrial cities have established co-operative courses in their high schools in which the students spend part of the time during the junior and senior years in school and part in the local industries; through this system, the industries have recruited many very promising young men.

There is nothing particularly new about any of these ideas as each is being carried on somewhere, but yet there is no general movement of co-operation between these two mutually dependent agencies of vocational education. In Philadelphia, for instance, a well worked out plan is in operation. Certain of the metal-working plants there have opened their doors to the pupils of the public schools, give them practical experience for two weeks, and then exchange with an equal number who have been in school for the same length of time. This alternating between school and shop continues from the time the boy becomes sixteen until graduation, with the same boys usually receiving their practical work in the same shops providing it is mutually agreeable. On graduation, the boy frequently becomes an employee of the firm with which he has been co-operating. The firm has had an excellent opportunity to try him out.

On the other hand, industry may very profitably send her apprentices to the public schools for this related instruction as is being done by smaller firms who feel unable to conduct their own schools. Four hours a week, preferably Saturday morning, may be devoted to this purpose, and a surprising amount of ground may be covered in this time with competent teachers.

On the request of a number of its members, the Metal Manufacturing Association of Philadelphia, arranged with the Philadelphia School Board to give related instruction to the apprentices of its members. Saturday morning was devoted to this purpose and a high school building made available. These boys are instructed in shop mathematics, shop practice, and mechanical drawing, the instructors being selected from the vocational teachers of the Philadelphia Public Schools.

ONE other phase of co-operation between industry and the public school is still necessary to effect a complete co-ordination of effort. Industry should make a place in its shops for the public school instructor during the summer months. Why blame the instructor if his teaching is academic or impractical? It's not his fault. He is most anxious to do his job well and will take advantage of such an opportunity if it is made reasonably attractive. Many such teachers spend part of their vacation at a summer school in order to advance themselves. For the same reason, they would be glad to take advantage of an opportunity to learn more of the practical side of their work. The public school people should recognize this effort in some substantial way; in fact, it should be recognized in much the same way as an equivalent effort for academic advancement is recognized.

If all of these three conditions could be brought about —the school boy spending part of his time in industry, the apprentice of industry spending part of his time in school and the school teachers spending their summers in the shops with proper recognition from the school authorities—then we would have the public schools and industry working hand in hand, each helping the other, to the benefit of both, and each doing that part of the work for which it is best fitted.

Practical Heat-Treating

IN THE SMALL SHOP

Specific hints for those who know little of the scientific side of heat-treating and who do their work in the smaller shops where the simplest equipment has to do the work

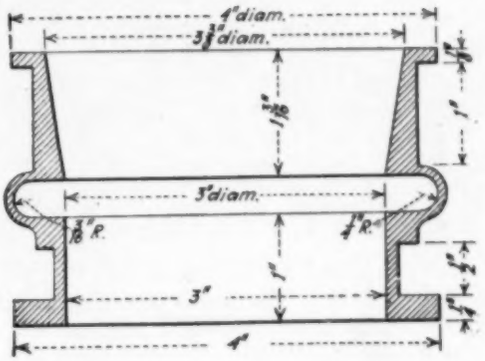


Fig. 1—An intricate shape such as this should never be made of water-hardening carbon steel because the danger of loss due to cracking more than offsets any saving in cost over a more expensive oil-hardening alloy steel

By Arthur Mumper

MAKERS of tool steel will never get full credit for their product as long as the men who are responsible for heat-treating steels abuse it by treating it all alike, heating it up to any old temperature and quenching it in whatever medium their fancy dictates. There is considerable of this sort of heat-treating going on, and as long as it continues, the warped, distorted, cracked, and completely broken dies and tools will continue to pile up, and small shop owners will continue to wonder where so much of their profit on certain jobs goes.

By the time a piece of tool steel is cut off and worked upon for several days by a high-priced tool maker, it has become an expensive piece of steel; yet many shop men get careless at that most important point, heat-treatment. While it is true that a number of tools made from the same bar of steel, and having approximately the same shape and cross-section, can be treated alike in the hardening room, it does not follow that another piece of steel cut from the same bar and worked into a very intricate shape, such as the one shown in Fig. 1, with heavy and thin sections, can be given a like treatment; it can't.

In the first place, a piece of water-hardening or common high-carbon steel should not be worked up into an intricate shape. That is a mistake to begin with. It should be made from an oil-hardening alloy steel. Under the assumption that the piece was made from the former, however, it should be heated slowly to the lowest temperature at which it will harden and give a good grain, about 1,375 deg. F., and quenched in an acid bath, after which it should be drawn immediately in an oil or salt bath to the desired temperature. It should be kept in mind that either oil- or water-hardening steel should be removed from the quenching bath while still hot enough to boil water and placed immediately in the drawing bath. This practice serves to prevent cracking, and at times, the complete bursting of the steel.

Bursting of a piece of steel is usually the result of heating it to too high a temperature and drawing at too low a temperature to remove the extra strain set up by quenching from this high temperature. Often, bursting may be caused by not drawing long enough, as in the example shown in Fig. 2. This is a draw punch for a Studebaker brake drum, 16 in. in diam. and 6 in. thick, weighing 425 lb., and made of 0.90 carbon steel. It was quenched from the right temperature and drawn at the right temperature, but not drawn long enough. In drawing, there is a rule usually practiced which requires at least one hour of time for each inch in thickness of the steel. This rule is good in many instances, but in treating this particular draw punch it was difficult to adhere to it as the diameter of the punch was so large that the volume of solid steel could not be completely drawn in the alloted time. This punch was quenched at 1,425 deg. F. and drawn for 6 hours at 325 deg. F. The next morning it showed the series of cracks indicated. A new forging was ordered, and when the punch was ready for heat-treating, the same quenching and drawing temperatures were used, the only differences being in the length of drawing time, which was extended to 10 hours. This punch was highly satisfactory. As a punch of this size is the exception rather than the rule in small shops, the heat-treating data is given here.

Always it has been the writer's practice to place the steel on a hot plate and let the temperature rise slowly as high as the burners under the plate would allow, which in this unit was 500 deg. F. In the meantime the furnace is warmed up to a temperature not much higher than the hot plate. The steel is then placed in the furnace and the temperature very slowly raised to the desired amount. It is not good practice to place a piece of steel in a hot furnace without first pre-heating it to as near the furnace temperature as possible. To put the

piece in cold causes a too rapid expansion of the parts coming in contact with the heat, resulting in distortion. The tendency is for the outside, which heats rapidly, to pull away from the center, which is still cold. A stretching distortion of the grain takes place which cannot altogether be overcome.

The heating of the draw punch previously mentioned required close to 7 hours, as it is very essential that a piece of that size have time to heat through slowly. Soaking at the quenching temperature is not recommended as this always causes an undesirable enlarging of the grain in most grades of steel. When 1,425 deg. F. was reached, the punch was water quenched and withdrawn when it was still hot enough to boil water, and immediately placed in the oil bath for drawing. To leave it exposed to the air between the quenching operations would have only invited breakage. The temperature of the oil bath was set at 325 deg. F. The above treatment with the grade of steel used will give a scleroscope reading between 90 and 95, which is hard enough to give good results when drawing well pickled and annealed stock.

The hot plate used worked out so well that a description of it is given here. The top is a cast-iron plate 24 in. square by 1½ in. thick, mounted on legs which give it a height of 30 in. Twelve Bunsen burners are placed underneath, three to each side, and about 3 in. from the under side of the plate. Six inches below the burners another plate is mounted, and under this plate four more Bunsen burners are placed. The sides between the plates are inclosed by ⅛-in. steel plate. The front is left open, but is bricked up after the work has been placed inside and the thermocouple inserted.

This hot plate is also used extensively for drawing oil-hardening steel piercing die plates. While the parts are in the furnace, the gas is adjusted under the hot plate until a steady temperature of 385 deg. F. is attained. For example, a die plate for a brake drum piercing die, 14 in. in diam. and 2 in. thick with a center hole 4 in. in diam. and six $\frac{13}{64}$-in. hub flange bolt holes, was heated carefully to 1,500 deg. F. and quenched until oil bath and die plate has reached the same temperature. Then it was drawn in this furnace to 385 deg. F. for 6 hours, coming from the hardening room checking within plus or minus 0.001 in. of the specifications and with a scleroscope hardness between 80 and 85.

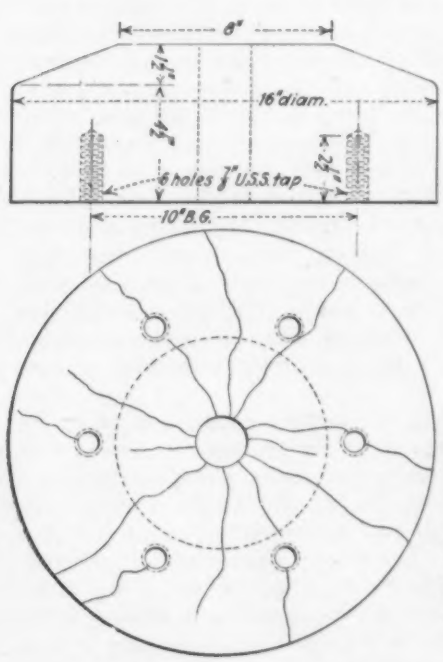


Fig. 2—Failure of this draw punch is attributed to too short a draw, although at the right temperature. Success was attained by increasing the drawing time from 6 to 10 hours

It is wise to draw non-shrinkable, oil-hardening steels rather longer than may seem necessary, inasmuch as these steels are very dense and do not set perfectly until 10 to 15 hours after quenching. Too short a drawing time means the risk of cracks or distortion developing after a brief interval. To get the best results each and every make of oil-hardening steel should be studied in the light of its different needs. While the instructions given by the manufacturer must be adhered to, it is necessary for the man in charge of the heat-treatment to develop and use his own judgment.

Press Guards—Good and Bad

By E. J. Clarke
Turnstedt Manufacturing Company

NO MAKE of guard or device will operate equally well under all conditions and with all kinds of stamping operations. Selection of a guard should be based on the character of the press and the work to be fabricated. In making the selection, it is important that the hazards and influences be considered fully. The following suggestions apply to specific conditions:

Conditions	Desirable Devices	Undesirable Devices
Slow press, large parts. One or two operators.	Gate guards, both sides; tongs; vacuum cups; good supervision	Electric buttons, air, and mechanical handles to be tripped, sweeps, poor supervision.
Fast press, small parts. One operator	Electric buttons, double-handle trips, sweeps, hand tools, instruction.	Gate guards, heavy sweeps, two-hand device, one used, sweep to wrong side, excessive speed, inadequate instruction
Extensive Production. Various presses.	Auto feed, slides, dials, magazines, guards actuated by press, sweeps	Hand-operated devices, gates, wrong-direction sweeps, distraction.
Meager production. Various presses.	Devices meeting safety conditions and adapted to the work.	Devices easily defeated, not adapted to work, or press or feed method.
Safest Operations. Various presses and productive methods.	Press-operated guards connected close to dies, sweeps right direction, suitable hand tools, proper supervision	Guards remotely connected, guards hand-operated or can be defeated by operators, obstructions near dies, meager supervision.

Abstract of a letter in the bulletin of the Power Press Section, National Safety Council, January, 1930.

AUTOMATIC oxy-acetylene, shape-cutting machines have been made to cut practically as smoothly as the design may require. For ordinary work, the cut surface is like a saw cut in wood, but extremely smooth cuts can be produced by slowing down the traveling speed of the torch. The automatic torch is now used for making such articles as parts for crawler and wheel-type tractors, yokes and rotors for generators and motors, transformer covers and tanks, drums and operating levers for hoists, parts for kilns, and steady plates for condensers.

Oxy-acetylene has even been used to cut holes in stern posts of ships where the metal was 16 in. thick, and the hole 20 in. in diameter. The surface of the cut was smooth and close to size.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Finding Clearance for Work on Boring Mills—*Discussion*

BY W. R. NEEDHAM
Engineer, Designing Dept. English Electric Company, Ltd.

READING the article under the title given above, by K. Takahashi, on page 1016, Vol. 71, of the *American Machinist*, reminded me that the same results could be secured by a simple chart drawn on cross-section paper, such as the one illustrated. The engineer would do well to make a tracing of the chart, so that he

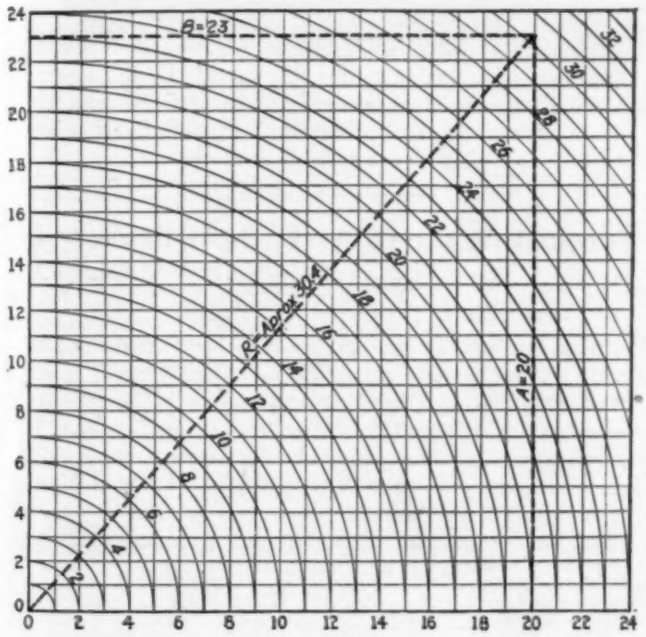


Chart for rapid approximation of hypotenuse of right-angled triangles

can superimpose it over any particular item on the drawing. In that case, he can obtain the required hypotenuse from the known values by simple proportion. The use of the chart is practically self-evident, and it has many applications apart from the one immediately under discussion. Taking Mr. Takahashi's example of the stator, where dimension *A* is 20 in. and dimension *B* is 23 in., the radius *R* required (see dash-dot diagonal line) is approximately 30.4 in. (30.48 by the slide rule). Other values may be found as quickly.

It should be remembered the sides of the involved triangles are strictly proportional, and that they can be divided or multiplied, provided it is done so throughout. Thus, the chart is based upon 24 unitary subdivisions (base 24, height 24) with a maximum diagonal of 33.94. Obviously, these proportions must be preserved.

An application of the chart, which I published in *The Draughtsman* (British) several years ago, accompanied by virtually the same skeleton chart, was the determination of the magnitude and direction of resultant forces from the rectangular components, or of components from the resultant. Diagonals radiating from the origin could be added to indicate angular values. Interested readers will doubtless find other applications.

A Cam-Operated Milling Fixture

BY ARTHUR MUMPER

In Fig. 1 is shown a longitudinal section of a cam-operated fixture for rapid production on a hand milling machine. While the fixture was designed for the production of one particular part, it can be used equally well on a variety of work, since the cutters can be adjusted to suit any piece that will fit in the fixture. Four cutters are used, two of them being carried on the main arbor, while the other two are carried on an auxiliary arbor mounted in a head attached to the machine column. The auxiliary arbor is driven from the main arbor by helical gearing. Both arbors run in roller bearings and are sup-

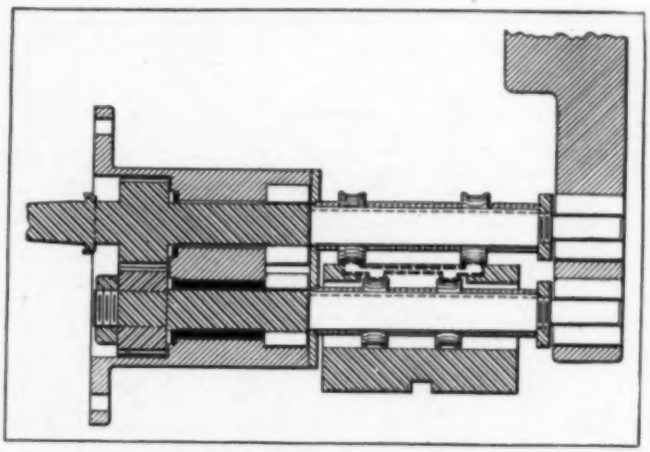


Fig. 1—Longitudinal section through the fixture

ported in a bracket attached to the overarm, as shown in Fig. 2. The work is indicated by heavy dotted lines.

In order to get the lower cutters in under the work, after they have been mounted and spaced in their correct relation to the upper cutters, it is necessary to remove the operating lever and to slide the movable part of the

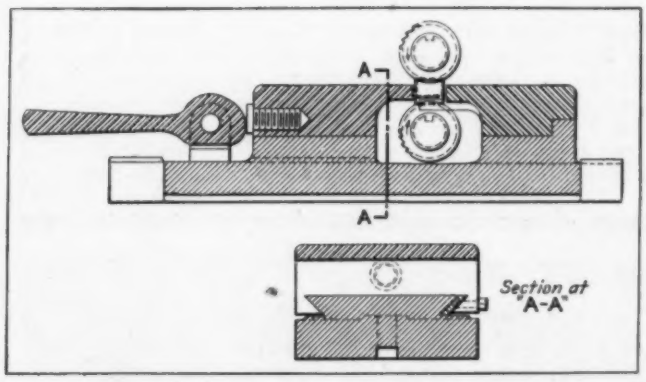


Fig. 2—Sectional view of the cutter head, showing the work and the cutters

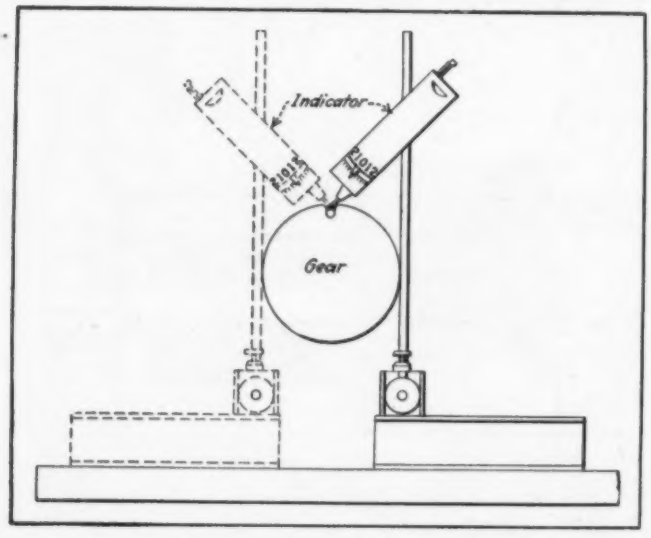
fixture as far back as is possible. After the adjustments have been made, the lever is replaced and the fixture is ready for use. Although this may appear to be an awkward way of getting the machine set for production, it must be remembered that the parts are milled in very large quantities, and it is not often necessary to tear down the set-up.

Centralizing Gear Cutters

By Charles Kugler
General Electric Company, Philadelphia

In cutting gears, there is always more or less doubt in the mind of the workman as to how near central he has set the cutter in relation to the work. The only reliable method I have seen of centralizing the cutter is shown in the illustration.

If a trial cut is taken and the position of the cut is checked by an indicator, first on one side and then on the other, as shown, it will readily be seen just how much and in which direction to move the cross-slide to bring the center of the cutter into coincidence with the center of the work. By referring to the sketch it will



Testing the centralization of gear cutters

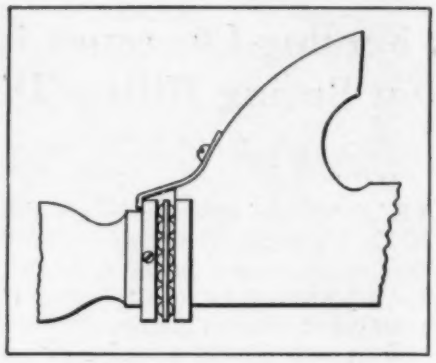
be seen that the rod carrying the indicator is brought into contact with the work at opposite sides, acting as a stop. When the indicator reading is the same in both positions, the cutter is in the center of the work.

Ball Thrust-Bearing Applied to a Vise Screw

By Dexter W. Allis

The application of a ball thrust bearing to the screw of a vise, as shown in the illustration, greatly increases the efficiency of the tool, not only because of the increased pressure obtainable, but also because of the ease with which ordinary pressures may be obtained.

Upon first thought, it might appear that lessening the friction between the collar of the screw and the body of the vise would result in the tendency of the jaws to loosen up their grip, through the easy turning of the screw. Such is not the case, however, since the additional pressure secured acts to produce more than ordinary friction between the screw and the nut.



Ball thrust-bearing applied to a vise screw

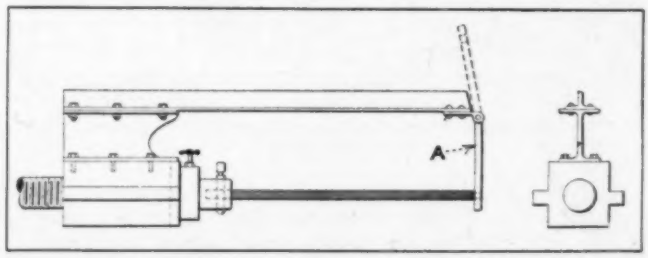
A wide strip of steel secured to the front jaw of the vise, as shown in the illustration, shields the bearing from dirt and also serves to pull back the jaw.

Supporting the Outer Ends of Broaches

By Don R. Hammitt
Chief Engineer, Portland Forge & Foundry Company

A support strong enough to keep the outer ends of broaches from serious deflection is shown below.

A short piece of I-beam, planed on both the top and the bottom, is attached to the traveling head or ram of the broaching machine, and on top of it is attached a piece of T-bar long enough to reach to within one inch of the end of the broach. The end of the T-bar is

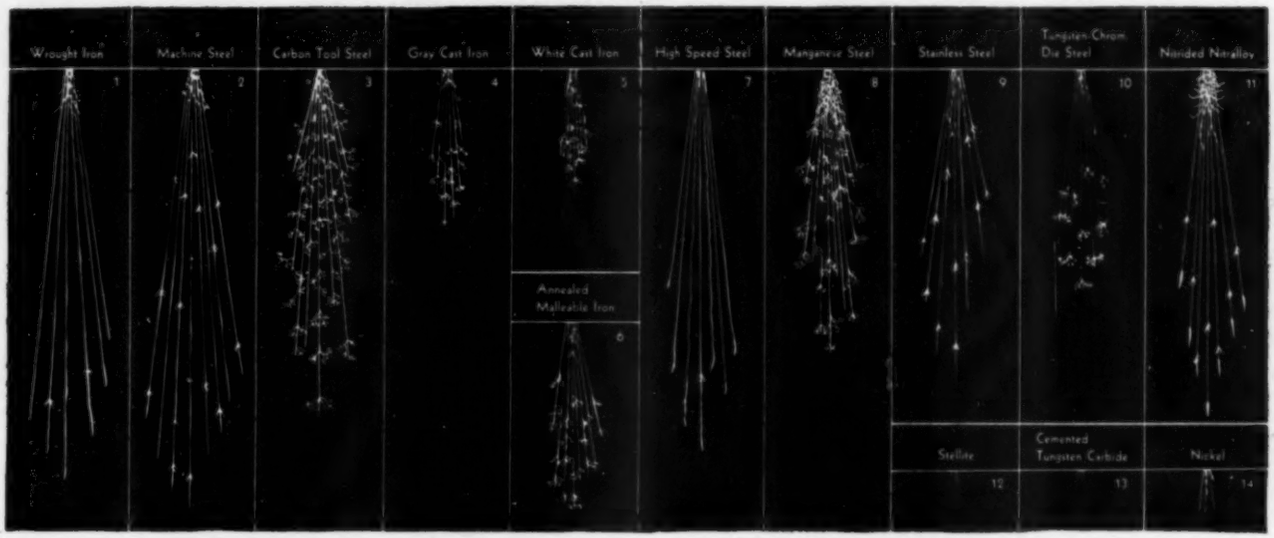


Support for the outer ends of broaches

beveled as shown. The piece *A* is hinged to the flange of the T-bar, and has a hole in its lower end to engage the end of the broach. When this piece is swung up out of the way, the beveled end of the T-bar permits it to be swung back of the vertical, so that it will stay up while either the work or the broach is being removed or placed.

The outfit can be made to suit broaches of various lengths by having the T-bar long enough for the longest broach and drilling a series of holes, or cutting slots, in its flange for the screws for attaching it to the I-beam.

Spark Testing of Metals



SPARK TESTING, long a metallurgist's hobby, has become increasingly important with the development of the new alloys. It is a reliable and adaptable method of classifying slightly different steels, in checking mixed stocks, in testing decarburization depth, and in determining the quality of metal in a weld. It has numerous advantages over other testing methods, being applicable cheaply and rapidly to large quantities, something which cannot be claimed for chemical, Brinell, Rockwell, fracture, scleroscope, or similar methods, although these latter are far more accurate. Spark testing will not test the quality of steel, for it will not show laps, seams, cracks, hardness, or grain size, but is simply a safeguard. It requires a trained observer, but the principles are easily mastered.

CHARACTERISTICS OF SPARKS

Metal	Volume of Stream	Length of Stream, Inches	Color of Stream Close to Wheel	Color of Streaks Near End of Stream	Quantity of Spurts	Nature of Spurts
1. Wrought iron	Large	65	Straw	White	Very few	Forked
2. Machine steel	Large	70	White	White	Few	Forked
3. Carbon tool steel	Moderately large	55	White	White	Very many	Fine, repeating
4. Gray cast iron	Small	25	Red	Straw	Many	Fine, repeating
5. White cast iron	Very small	20	Red	Straw	Few	Fine, repeating
6. Annealed mall. iron	Moderate	30	Red	Straw	Many	Fine, repeating
7. High speed steel	Small	60	Red	Straw	Extremely few	Forked
8. Manganese steel	Moderately large	45	White	White	Many	Fine, repeating
9. Stainless steel	Moderate	50	Straw	White	Moderate	Forked
10. Tungsten-chromium die steel	Small	35	Red	Straw*	Many	Fine, repeating*
11. Nitrided Nitralloy	Large (curved)	55	White	White	Moderate	Forked
12. Seellite	Very small	10	Orange	Orange	None	
13. Cemented tungsten carbide	Extremely small	2	Light orange	Light orange	None	
14. Nickel	Very small**	10	Orange	Orange	None	
15. Copper, brass, aluminum	None				None	

*Blue-white spurts. **Some wavy streaks.

Description of sparks from typical metals is condensed in the accompanying table and sketches. Terms used are relative rather than absolute. For example, the length of the spark stream depends, for one thing, upon the pressure between wheel and piece, and color depends upon extraneous light. No sketch or photograph has yet been produced which will show sparks exactly.

The order of colors in sparks is: red, orange, light orange, straw, and white. All colors tabulated refer to streaks, not spurts. "Spurts," bursts, or explosions, indicate carbon and appear in a formation suggestive of blossoms. Nickel and tungsten have some restraint on the brilliance of spurts. "Spear points" at the ends of lines indicate molybdenum. A "forked spurt" is a rather simple form, with all branches emanating from a single source, as in machine steel. A "fine, repeating spurt" is one whose branches repeat, or re-explode, as in plain high-carbon steel.

All commercial iron contains a slight amount of carbon, indicated by the slight branching or forking of the luminous streak. Wrought iron (1), in the sketches, represents nearly pure iron with few spurts. Low carbon machine steel (2) yields a few rather plain spurts. As carbon content increases in plain steel, the explosions increase and assume more intricate patterns. They are so profuse in carbon tool steel (3) that the stream becomes very bushy. Particles from the initial explosion dart out and repeat with secondary spurts, producing a fine, branching, network of light.

Next, three cast irons are represented. Differentiation between them is not very apparent at first glance. Streaks near the wheels are red, and spurts from all are similar to those from carbon tool steel, although the length of stream from each varies. White or hard iron (5) shows many non-curving streaks close to the wheel. Sparks from annealed malleable iron (6) are more profuse than from soft or gray iron (4).

High-speed steel (7) is not easily mistaken. The dull color near the wheel and its long spark length are apparent. Manganese steel (8) yields a stream of explosive bushiness approaching that from carbon tool steel. Stainless (chromium) steel (9) could be confused with machine steel, although its sparks are of less brilliant color near the wheel and the stream is thinner. Tungsten-chromium die steel (10) differentiates itself from the cast irons by blue-white glows at the spurts. Nitrided Nitralloy (11) exhibits one surprising eccentricity; sparks near the wheel form whorls, some of which actually turn from the main line of travel by much over 90 deg. The same tendency, to a lesser extent, is exhibited by manganese steel and to a still lesser extent by some of the other steels.

The last three streams represent nonferrous metals. Stellite (12) and cemented tungsten-carbide (13), in contrast to their brilliant performance as tools, provide drab fireworks. The line of travel is plain and short, and the temperature color from the carbide material is slightly higher than that from the Stellite. Nickel (14) yields a spark which at first might be confused with one from Stellite. Closer observation, however, will reveal a wavy motion of some of the nickel streaks, while the Stellite streaks are all straight. Streaks from these last three materials taper to extinction.

Sketches and table from "Grits and Grinds," publication of the Norton Company

© American Machinist

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Vol. 72 NEW YORK, APRIL 24, 1930 No. 17

The Hoover Medal

HIGHLY significant of the increasingly important place in public esteem occupied by the engineer was the Hoover medal which was presented at the fiftieth anniversary celebration of the American Society of Mechanical Engineers at Washington. Founded by Conrad N. Lauer as an award for meritorious public service by engineers, it was eminently fitting that the first medal should go to Herbert Hoover for his great contributions to public welfare during and since the war.

Mr. Lauer is to be congratulated for his vision in establishing the Hoover medal foundation. Too long has the engineer been content with the conquest of materials. Only recently has he turned his talents to the directing of men and to the improvement of their surroundings, both in industry and at home; but already he has done much to lift the burdens of drudgery and to make the daily task more satisfying.

No form of award is needed to stimulate engineers to service of this nature, but it is at least a satisfaction to have some means of publicly recognizing unusual merit.

*

The Photo-Electric Cell as a Safety Device

AN EDITORIAL in the first number of the new magazine ELECTRONICS suggests a use for the photo-electric cell that may have considerable significance for industry. It is the use of such a device in the operating circuit of a production machine, such as a punch press, to protect the operator if any part of him gets into a dangerous position.

In the punch press it would be entirely possible to substitute for the mechanical guard now in use a photo-electric cell in line with a beam of light playing across the space in front of the dies. If the operator interrupted the beam of light by hand, arm, or head, the clutch mechanism would be held from disengaging by the electrically relayed action of the photo-electric cell and the ram would not descend even though the foot trip were actuated. The press could not be operated if the cell burned out or failed in some other way.

The practically instantaneous action of the photo-electric cell makes it particularly suitable for such use. Another great advantage of such a form of safety device would be that nothing tangible would intervene between the operator and his work, and hence there would be no temptation to disconnect the safety device so that greater speed of output might be possible.

This application is only one of many that will suggest themselves to alert machine builders and designers who are interested in building safety into their products. It will be interesting to see who first makes use of this new apparatus.

*

Ceremonial Raiment for Engineers

IT SEEMS somewhat inappropriate to talk of ceremonial raiment for the engineer because he has always fought shy of ceremony in his devotion to the job at hand, for which overalls were often more useful than flowing robes. Yet there are occasions when the engineer should forget the practical responsibilities that are his accustomed load and attire himself with dignity to honor those of his fellows deserving of honor.

A case in point is the convocation for the presentation of medals at the A.S.M.E. celebration. Sixteen fiftieth anniversary medals were presented, to one American and to representatives of fifteen foreign countries each of which was represented by its minister or ambassador to the United States, who introduced the medalist from his particular country. The affair was carried off with impressive ceremony under the direction of the Society's committee on awards. Each of the four marshalls appeared in academic custume to lend a touch of color and formality to the occasion.

Those present were favorably impressed by the manner in which the formalities were conducted, which indicates that there is a place for formal affairs and for appropriate ceremonial raiment.

On this occasion academic garb was used because the engineer has no uniform or costume particulary his own. The question is, should engineers adopt some form of uniform analogous to the black gown of the law, or the robes and hoods of the universities, and if so, what should it be?

SHOP EQUIPMENT NEWS

Davenport Improved Model B Five-Spindle Screw Machine

COMPLETE REDESIGN of its Model B five-spindle automatic screw machine was entered into by the Davenport Machine Tool Company, 167 Ames St., Rochester, N. Y., to increase the machine's productiveness, to make it more universal in application, and to provide greater durability. This machine is now offered to the trade with many added features and attachments. The illustrations, however, show a model specially equipped with a box base and an elaborate system of guards, which can be turned up out of the way while the tools are being adjusted. A cabinet in the box base provides space for the convenient storage of the gears and cams not in use. These special features are available at extra cost.

In making the machine more productive, the set-up time and the operating time have been greatly reduced. To effect this the following design features are included:

1. Stock feed length changed by a crank.
2. Non-cutting time of tools reduced to ½ second.
3. Adjustments for cross-slides and tool arms at the front.
4. High-speed threading clutch efficient on either brass or steel.
5. Clutch provided between turret tool cams and cross-slides.
6. Only one gear need be changed when changing from one speed to another.
7. Extra sleeves carry all cross-slide and turret cams for the next job.
8. Rapid loading attachment operated from regular working position.
9. A chute delivers the finished work.
10. Compensating stop screw rigidly mounted on the cross-slides.
11. All levers for feeding and operating situated at the front of the machine.

Job work and short runs are done profitably because of the more universal application of the machine. Special equipment can be provided for threading in any convenient position. Four revolving drilling spindles can be used while operating the threading equipment, if desired. Special attachments for slotting, burring, and drilling, and a fifth cross-slide, a self-opening die, and a chip conveyor can be furnished if desired.

Better finished work and longer life for the tools is assured by the fact that each tool has a separate feed and adjustment for length. Either steel or brass pieces can be produced with equal efficiency. Ten threads, any pitch, can be cut on brass work at the rate of 60 pieces per min. A wide range of spindle speeds permits the use of the most efficient cutting speed for any class of work.

There are five turret tools and four cross-slide tools, each having its own independent movement. As stated previously, a fifth cross-slide can be added, when desired. All operations are performed simultaneously, and the actual time for a piece of work is the time of the longest operation plus ½ sec. In some cases the longest operations can be divided into two or more short operations by doing the work on different spindles. Tolerances as close as 0.001 in. or less can be maintained when the machine is provided with suitable tool equipment.

The work spindle head is supported on the outer end by a pair of rollers, to take care of the overhang and the weight of the wire case carrier. The locating blocks are hardened and ground. Work spindles are driven by an internal gear running on the hubs of the spindle gears, and indexing is done by a Geneva disk. Stock feeding occurs while the head is indexing. The feeding sequence is as follows: the head is unlocked, the chuck opened, and the stock fed forward against the face of the first-position tool holder. After these movements, the chuck is closed, the head positively locked, and the feed tube again withdrawn, ready for the next piece. Less than ½ sec. is required for these operations. The length of the stock feed can be ad-

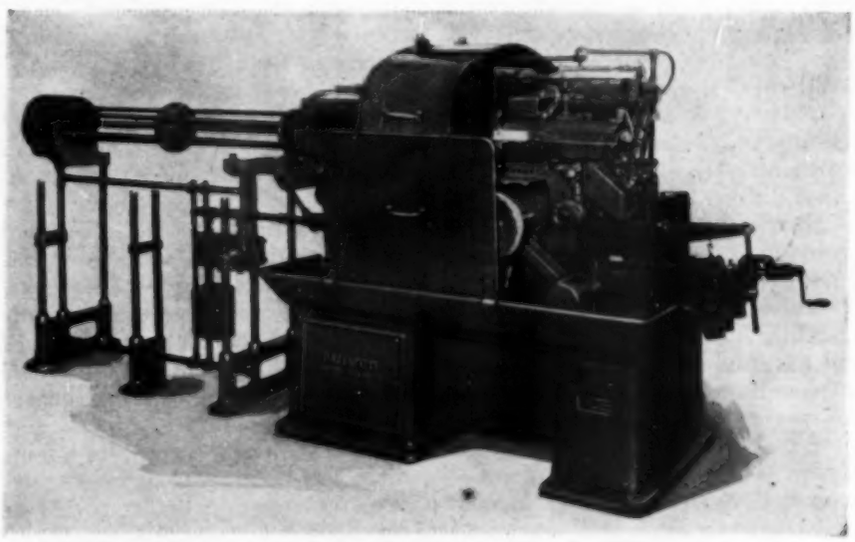


Fig. 1—Davenport Model B Five-Spindle Automatic Screw Machine equipped with a special box base, chip guards, and chip conveyor

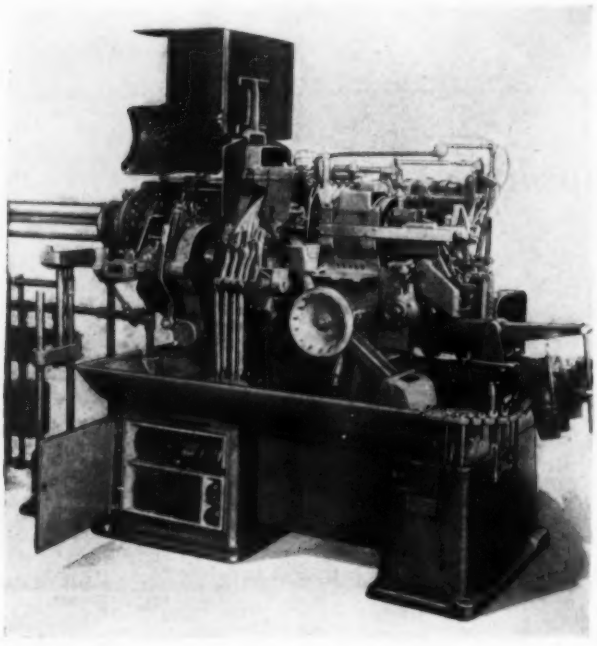


Fig. 2—Close-up of the Davenport Model B. Automatic Screw Machine, showing the guards turned up out of the way so that the tooling may be adjusted

justed by a small crank conveniently located at the top of the feed slide lever. The stock feed cam, which also operates the chuck, is a hardened steel forging built as a unit with the worm wheel and crank that operates the Geneva disk, thus eliminating all lost motion between the various movements.

Two different speeds are provided on the camshafts. One half of the revolution is made in ½ sec., and the speed of the other half revolution determined to suit the job.

Each spindle in the tool spindle head has its own separate cam. The tool spindle levers have a graduated face where a sliding block (connected to the tool spindles by a turnbuckle) may be raised or lowered from the center line of the tool spindle to vary the feed of the tool as much as 20 per cent of the rise of the cam. A camshaft clutch disconnects the tool spindle camshaft from the driving worm wheel so that the turret tools can remain in the back position, while the cross-slide tools operate as usual. This is a convenience when tooling up or feeding stock into the machine.

Four forming, cutting off, or other cross-slide tools can be used. Two regular cross-slides are securely attached to the bed on renewable seats, and two are placed on swinging arms. A fifth cross-slide can be added easily. Cutting-off and forming tools are circular and have plain holes instead of threaded holes to facilitate centering. Each tool has a screw for longitudinal adjustment, and an eccentric for making a forming tool cut parallel, or otherwise, with the center of the work. Two separate clutches operate the camshaft. The high-speed clutch is one of the single-plate type and is located at the rear of the machine. The low-speed clutch is of the "roll-away" type and is located in the feed change gear box integral with the driven feed change gear. For changing feed gears, it is necessary to change only one gear, as two compound gears are provided on a swinging arm and can be easily rolled into mesh.

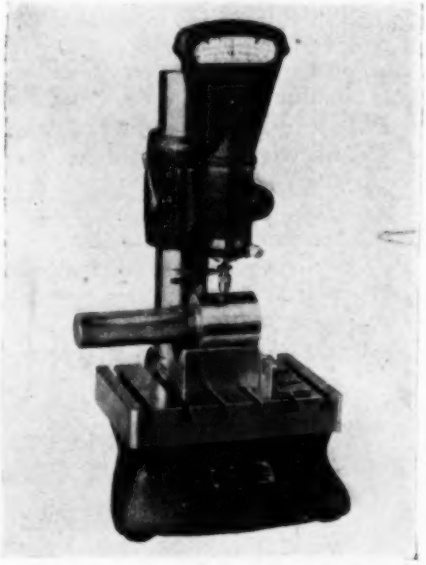
Drive is from the motor mounted within a recess in the base. Drive to the sprocket at the back of the machine is through a silent chain. This drive gives positive, smooth operation.

The Model B five-spindle automatic screw machine has a regular capacity of the feed tubes of ½ in. rounds, $\frac{7}{16}$ in. hexagons and ⅜ in. squares. Special feed tubes with feed fingers soldered in can be furnished to take stock up to ⅝ in. round, $\frac{9}{16}$ in. hexagon, and $\frac{7}{16}$ in. square. The greatest length feed is 3 in. and the greatest length turned is 2½ in. Eleven spindle speed changes are provided, the range being from 600 to 2,400 r.p.m. Twenty-nine changes of feed gears are provided, the timing ranging from 1 to 20 seconds. The diameter of the circular tools is 2 in., and the diameter of the hole in the tool spindle is 1⅛ in. The smallest distance between the chuck and tool spindle is 2⅛ in. and the greatest distance is 4$\frac{13}{16}$. The machine is designed for motor drive, taking 5 hp. at 1,800 r.p.m. It occupies a floor space 36 by 176 in. and the net weight is 3,200 lb. The machine is finished in the Machine Tool Builders' Association standard gray

Société Genevoise Micro-Indicator Stand

A stand to make use of the micro-indicator tube described on page 239, No. 5, has been placed on the market in the United States and Canada by the R. Y. Ferner Company, Investment Building, Washington, D. C. This stand is being manufactured by the Société Genevoise d'Instruments de Physique, Geneva, Switzerland, and is built with the requisite accuracy for use with the micro-indicator. By its use the micro-indicator tube can be converted to a comparator for checking the three dimensions of flat blocks, the diameter of cylindrical pieces, the outer diameters and thicknesses of rings and ball or roller races, the diameter of steel balls, the major diameter of screws, and the thickness of thin sheets or ribbons.

The base and column of the stand are of very heavy construction, the total weight being 48 lb. The table for supporting the pieces tested is 5 by 7 in. and is made flat throughout within less than 0.0001 in. This table is provided with six T-slots, which serve for securing two angle plates in any positon or a V block for the support of cylindrical pieces. The micro-indicator itself is supported in a heavy arm secured to the column by a strong clamp. The axis of the in-



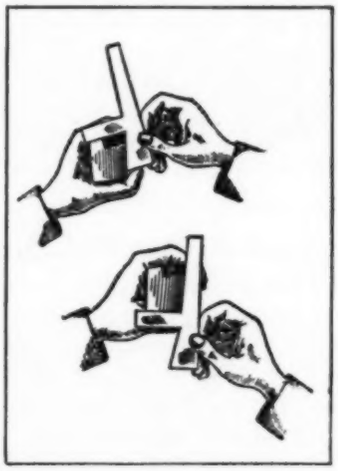
Société Genevoise Micro-Indicator Supporting Stand, which permits the use of the apparatus as a comparator for pieces 6 in. high and 12 in. in width

dicator is 3⅜ in. from the face of the column.

Since the swinging of this arm over any portion of the testing area would be prevented by the use of a rack and pinion for the vertical adjustment, a fine adjustment is provided for raising and lowering the piece holding the instrument. To accommodate pieces of extra large area or having a shoulder or other projection, a ¾-in. adjustment of the table forward from its central position is provided. This feature makes it possible to measure flat pieces as large as 12 in. in width. The vertical capacity of the apparatus is 6 in. when using the spherical contact point, but with a flat contact the capacity can be increased to 6½ inches.

Prosser Grinding Gage for Tungsten-Carbide Tools

The proper grinding of tungsten-carbide tools is one of the first essentials in their use, but as hand grinding is recommended, the results are often quite indifferent. As an aid to mechanics having to grind such tools, Thomas Prosser & Son, 15 Gold St., New York City, are distributing gratis a stainless steel gage and a leaflet of recommendations. The uses of the gage are shown in the accompanying illustration, the upper figure representing the gaging of the clearance, and the lower figure the gaging of the tool angle.



Prosser Grinding Gage for Tungsten-Carbide Tools in use

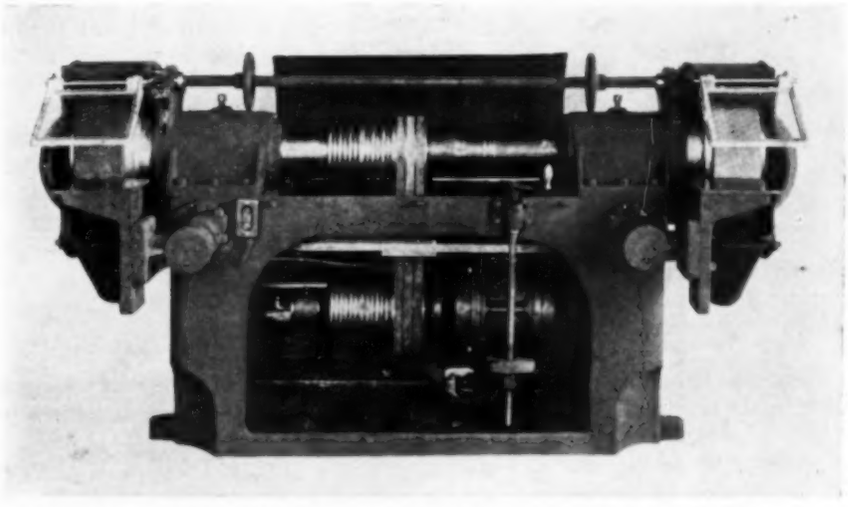
The gage has been designed for use on tools employed to cut cast iron, but the leaflet gives a table of clearances and tool angles for various materials. With the use of these data, the mechanic can make his own gage when machining some particular class of steel or non-ferrous metal.

"Standard" No. 50 High-Speed Snagging Grinder

One of the recent additions to the line manufactured by the Standard Electrical Tool Company, 1938 West Eight St., Cincinnati, Ohio, is the No. 50 high-speed snagging grinder, of which a rear view is given. This machine is a heavy, high-speed floor-stand production grinder, having a working range of 7,500 to 9,000 s.f.p.m. The work rests and boiler plate hoods with overlapping covers are removable to accommodate any working conditions. The safety control device works in conjunction with the movement of the hoods.

The spindle is 4 in. in diameter, 74 in. long and is mounted in four SKF ball bearings. Three speed changes are obtained by three stepped V-belts, and drive sheaves on the spindle and motor shaft. The driving power is transmitted from the motor mounted in the base to the spindle through three Dayton V cog belts. The motor is positioned by means of a leadscrew.

The grinding wheels employed are of the ring type, 24 to 30 in. in diameter, with 12-in. hole and 2- to 4-in. face, according to the horsepower of the driving motor. The machine is made in the 10-hp. model for 24-in. wheels, and 15-hp. for 30-in. wheels.



Rear view of the Standard No. 50 High-Speed Snagging Grinder, showing the drive by means of three stepped V-belts

Paasche Multicolor Airbrush

One, two, three, or more colors can be applied at the same time by means of the "Multicolor" airbrush developed by the Paasche Airbrush Company, 1909-1923 Diversey Parkway, Chicago, Ill. The application of two, three or more colors at one time makes possible not only a great saving of time but also colorful decorative effects. Each color is controlled independently so that all colors may be applied at the same time or shut off at will, and may be varied from the finest line to the widest spray under perfect control. Multiple heads in 40 different combinations provide a wide coating range.

Paasche Multicolor Airbrush

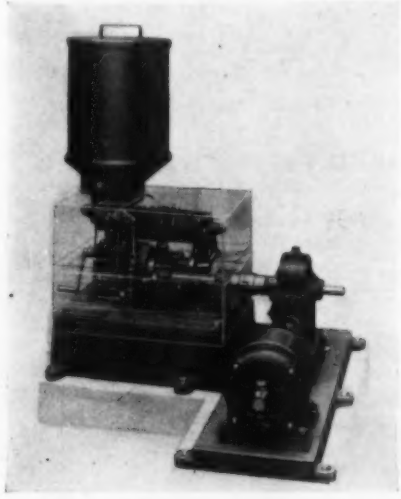
The airbrushes may be used as

single units or spread into gang units of any number of brushes manually or air-operated. It is claimed that almost all of the products are interchangeable with the older model air-brush and therefore reduces the cost of the changes.

Anderson Mill-Type Grease Pump

Fully mechanical means for pumping heavy mill greases is embodied in the Anderson pump placed on the market by the Hill-McCanna Company, Chicago, Ill. As shown in the accompanying illustration, this device is simple and sturdy in construction. It is positive in operation, delivering measured quantities of lubricant to the surface desired.

Grease is introduced into the feeding system of the Anderson mill-type grease pump by means of a displacement pump. A distributor head with the requisite number of leads is directly connected to the discharge side of the pump. The indexing of the head is secured by means of a ratchet



Anderson Mill-Type Grease Pump

attachment, which allows indexing on the suction stroke, and remains fixed during the discharge stroke, after which it indexes to the next delivery line.

Delivery lines are attached to the distributor head and lead to the connections of the equipment bearings. A steam heating element is installed in the bottom of the hopper casting and directly above the intake valve to facilitate handling of heavy greases during cold weather. The grease hopper has a capacity of 60 pounds.

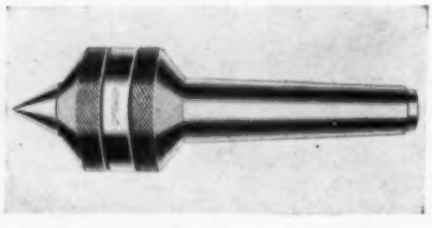
A screen is installed in the grease hopper bottom, beneath the steam heating element and above the intake valve, to prevent any foreign matter from entering the pump. Provision is also made for adjustment of the stroke of the pump to regulate the amount of grease delivery and also the speed of the drive. All running parts other than the motor and gear reduction unit are inclosed to provide safety and to protect the mechanism from dirt or scale.

The Anderson grease pump is built in sizes according to the number of feeds required. Present models consist of 4, 6, 8, 10 and 12 feeds per unit. Special sizes are made up to 24 feeds per unit. Where more than 24 feeds are needed, two or more units may be connected with a common driving mechanism. Pressures up to 5,000 lb. per sq.in. can be maintained.

Sturdimatic Heavy-Duty Roller Bearing Live Center

Improved design is evident in the live centers placed on the market by the Sturdimatic Tool Company, 12121 Cardoni Ave., Detroit, Mich. These centers employ Timken bearings to take heavy thrusts and will operate at the high speeds necessary when tungsten carbide tools are employed. They are made in 7 sizes with Morse tapers from 2 to 7, inclusive, and are also available in Jarno, B. & S., and other special tapers.

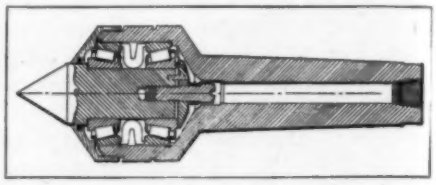
The rotating center point is made of hardened steel in any special size or shape to suit requirements. A felt grease retainer keeps dirt, grit, and foreign matter out of the bearings. The outer race of the Timken bearings is made a ring fit in the housing, which is supported by a cushion spring between the two bearings.



Sturdimatic Timken-Equipped Live Center for use on severe turning operations

The two inner races, together with the rotor, washer, spring and screw, rotate as one piece. A pipe-tapped hole in the tapered shank receives an Alemite cup, and the grease may be forced in until it overflows at the other end of the center.

A special feature is the cushion



A cushion spring between the two sets of Timken Bearings deflects when an overload is imposed on the center point, permitting the rotor to recede into the housing

spring, which is made of special spring steel. It prevents the front outer race of the bearing from sliding into the housing, until an overload or predetermined thrust is exerted on the rotor. Then this spring functions, which allows the entire rotor to recede, thus compensating for the overload. Furthermore the center is made to indicate overloads. When no overload exists, the rotor projects beyond the grit seal cap, and when an overload exists, the taper point of the center recedes to a point flush with the grit seal cap.

Rausch Rotary Die Filing Machine

Large savings over hand filing can be made with the Rausch rotary die filing machine on such work as: blanking, forming, and irregular shaped dies; templets and sheet metal parts; irregular shaped gages; cams and formers for profiling; filing master templets for engraving machines; filing perfect radii on dies, fitting punches to dies; making metal patterns, and other operations. The machine has been placed upon the market by the Rausch Manufacturing Company, Racine, Wis. It is claimed to save from 25 to 50 per cent of the labor ordinarily demanded by hand work on work of this type.

The usual method of fitting punches is to rough out the punch to a few thousandths larger than the size of the die and then by shearing take an impression. The next operation is to remove the exact amount of material.

Such work requires considerable hand work and skill. However, after the punch has been fitted to the die, it is possible to take this machine and using one of the type "B" rotary files obtain a clearance all around the punch, which will be exactly the same at all points. The type B punch has cutting teeth equal to the clearance desired. By this process uniform amount of break clearance can be obtained around the punch, no matter what the contour is. The sheared portion of the die can be removed with a type "A" rotary file.

Among the adjustments provided

Rausch Die Filing Machine

are: tilting of the work table horizontally either side, to obtain the exact degree of die clearance, and the motor and table can be reversed so that the file can be extended through the table, thus giving the operator a clear vision of the line. Adjustment is also provided for raising and lowering the motor, so that the file in chuck can be adjusted to the work in process similar to a milling machine. This last feature is of value in making metal patterns as well as for making dies.

Table Attachment for Porter-Cable "Speedmatic" Saw

When it is desired to change the hand type "Speedmatic" power saw to a table model, a table attachment, as recently announced by the Porter Cable Machine Company of Syracuse, N. Y., can be employed. The change can be effected in less than one minute. No wrenches are required, as it is necessary to loosen only a thumbscrew.

The swivel base upon which the arm swings has a graduated scale of 60 deg. either side of zero, although the arm can swing without hindrance in a circle. Adjustment is also provided for fluting, stripping, and dadoing. For ripping, the position of the saw is quickly changed over to another segment on the attachment. The arm is then pulled out and locked by a thumbscrew at any desirable width. For this type of cutting, the work is fed into the saw.

The table attachment is made of cast iron and the ways are dovetailed and gibbed to take up wear. The weight of the attachment including the saw is 52 lb., and the attachment can be fastened to a table by means of three bolts.

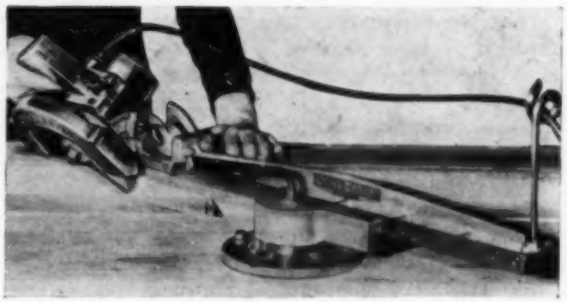
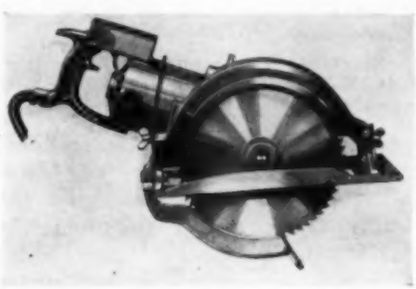


Table attachment for converting a Porter-Cable Portable Power Saw into a bench type

De Walt Acquires Wodack Electric Handsaw

Announcement has been made by the De Walt Products Corporation, Leola, Lancaster County, Pa., that it has acquired the Wodack electric handsaw, which is to be manufactured in four models by the Wodack Division. Of the four sizes manufactured, the model K weighs 15 lb., with a cutting capacity of $2\frac{5}{8}$ in.; model *C* with $4\frac{1}{8}$ in. cutting capacity; model *B* with the same cutting capacity as model *C* and the addition of a beveling feature, and the model *D* for handling $4\frac{1}{2}$ in material, and also equipped with the beveling feature.



Wodack Electric Handsaw, which has been added to the line manufactured by the De Walt Products Corporation

The device was described on page 680, Vol. 71, of the *American Machinist*, to which the reader is referred for further details.

"P.M.G." Metal—A Hardened Copper Alloy

As a substitute for phosphor bronze, manganese bronze, and gun metal, "P.M.G." metal was developed by Messrs. Vickers-Armstrong, Ltd., Barrow-in-Furness, England. The material is now available in the United States through the Driver-Harris Company, Harrison, N. J. From the experience of the originators, this alloy is superior and can replace phosphor bronze on economic and practical grounds. It is claimed to be superior to manganese bronze, to 70/30 brass, and 9 per cent aluminum bronze for many applications. It is, in fact, a hardened copper alloy, which can be utilized where high tensile strength, considerable elongation, and resistance to abrasion are required.

"P.M.G." metal was originally intended as a substitute for Admiralty gun-metal, the standard composition of which is 88 copper, 10 tin and 2 zinc. The metal is a copper alloy, in which the 10 per cent tin is replaced by 10 per cent of a special hardener. In making the alloy, however, the addition of the hardener need not be confined to 10 per cent. The alloys investigated have had hardener contents ranging from 1 to 18 per cent and zinc from 0 to 40 per cent but the standard composition is as given above.

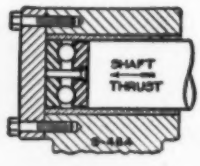
The alloy as cast contains as constituents 2 per cent of iron, 3.4 per cent of silicon, and 2 per cent of zinc.

Hardening is due presumably to the presence of iron silicide. The properties can be modified by heat-treatment, consisting in quenching with or without reheating. Heated castings do not scale.

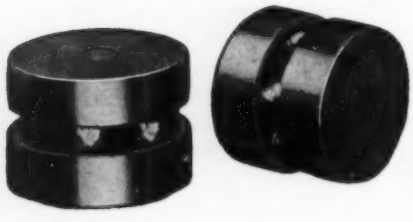
One group of sand cast bars had a yield point of 23,500 lb. per sq.in., ultimate stress of 47,500 lb. per sq.in., elongation of 10 per cent in 2 in., and a fine fracture, whereas on another test the yield point was 27,800 lb. per sq.in., ultimate stress, 49,300 lb. per sq.in.; elongation, 13 per cent in 2 in., and a grained fracture. The material can be forged hot readily without cracking. After forging to a black heat, the properties are as follows: yield point, 82,650 lb. per sq.in.; ultimate stress, 94,000 lb. per sq.in.; elongation, 17 per cent in 2 in.; and silky fracture. The metal does not become brittle even when the finishing temperature is very low. The Brinell hardness ranges from 104 as cast to 153 as forged.

Auburn T-114-RG End-Thrust Ball Bearing

The end thrust bearing T-114-Rg illustrated has been placed on the market by the Auburn Ball Bearing Company, Rochester, N. Y. This bearing fits in a recess at the end of the shaft, the recess being of the same diameter as the shaft, so that a minimum of machine work is required. Because of the small pitch diameter of the ball groove for a given shaft diameter, and because of the large size balls used, the peripheral speed of the balls is relatively low.



Obtainable in standard shaft diameters, this bearing simplifies assembly



The two races and balls are held together as a unit by a rod in the center, which is flanged on the ends, permitting free rotation of the races, yet holding them together. This is also a convenience in handling and installing the bearing. The races are heavy in section.

The bearings are available in sizes from $1\frac{3}{16}$ to $3\frac{15}{16}$ in. in diameter.

Reliance Stainless Steel Lockwashers

A stainless steel for lock-washers has been perfected, according to an announcement by the Reliance Manufacturing Company, Massillon, Ohio. The company is now prepared to furnish the trade with these lockwashers in any size or section. It is claimed that in addition to having all the qualities of a non-corrosive stainless steel, they are of a spring temper equal to that of the ordinary steel lockwasher. The steel is drawn by a special rolling process, by which it is finished in a Brinell of sufficient hardness to produce the stiffness and reactive pressure necessary in a lockwasher, and makes subsequent heat-treating unnecessary. This company is also in a position to furnish the trade with stainless steel in coils or straightened and cut to length in any small section—round, flat, square or hexagon = from 0.022 to $\frac{5}{16}$ inch.

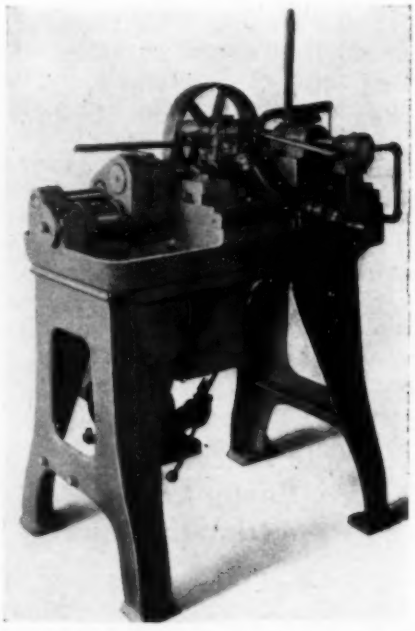
Breur Model 70 Industrial Vacuum Cleaner

A portable tank-type vacuum cleaner for industrial use has been placed on the market by the Breur Electric Manufacturing Company, 852 Blackhawk St., Chicago, Ill. This cleaner is designed especially for heavy-duty work in cleaning machinery, motors, overhead pipes, girders, walls, floors, and other applications. It is known as the Model 70 "Tornado," and employs an oversize $\frac{3}{4}$-hp. G.E. universal motor mounted on precision ball bearings. The motor is mounted on a cast-aluminum cover, which fits over a steel tank finished in aluminum. A special feature is the possibility of removing the motor from the cover to be used as a portable blower. A complete set of attachments is furnished to take care of any cleaning requirement. Other features are ample power, easy portability, and low cost.

Breur Industrial Vacuum Cleaner

Wells Thread Milling Machine

Designed to thread taps by means of a hob milling cutter at one revolution of the work, a thread milling machine of the type illustrated has been placed on the market by the Wells



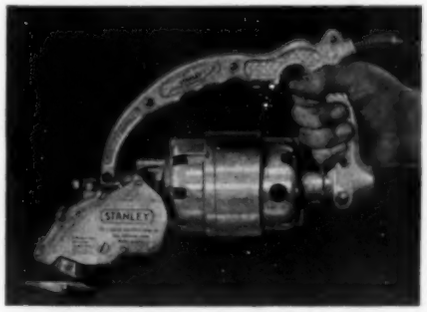
Wells Thread Milling Machine, which will thread up to 2-in. pipe taps at one revolution of the work

Manufacturing Company, P. O. Box 613, Greenfield, Mass. It will mill either straight or taper taps, with or without radial relief, up to the 2-in. size. No leadscrews or nuts are used, but the lead is produced by hardened and accurately ground cams, mounted directly on the work spindle.

All parts are easily accessible for the simple adjustments necessary. The tap blanks are driven by their squared ends, and no dogs nor clamping devices are required. The tail center is operated by a long vertical lever on the head of the machine, so a minimum of time is required to change the work. When each piece of work is completed the machine stops automatically. All worm gearing is inclosed and runs in oil, and a large oil tank is provided with a removable chip tray. Individual motor drive or single pulley drive can be had. The weight of the machine is 1,200 lb. and the floor space is 30x36 in. The motor required is of ½ hp. of any voltage.

Stanley-Unishear Sheet Metal Cutting Tools

The Stanley Electric Tool Company, subsidiary of the Stanley Works, New Britain, Conn., has purchased the trade name, stock, tools, jigs, fixtures, etc. of the Unishear Company, 270 Lafayette St., New York City, and will continue the manufacture and development of these machines. One of the items



"Mighty Midget" Sheet Metal Cutting Tool, which has been taken over from the Unishear Company by the Stanley Electric Tool Company

taken over is the "Mighty Midget," which will take to 18 U.S. gage sheet iron and can be used to cut sheet steel, aluminum copper, and also fiber. This device weighs 6½ lb. and will cut to a minimum radius of 1 in. It will cut straight lines and curves or notches up to a speed of 15 ft. per min., and leaves no burr nor distortion of the metal.

Besides the "Mighty Midget," there are several other models of semi-portable and stationary machines equipped to cut irregular shapes in various metals up to ¼-in. thickness.

Ransom Style H Snagging Wheel Guards

A line of guards for use with snagging type grinding machines has been placed on the market by the Ransom Manufacturing Company, Oshkosh, Wis. These guards are known as Style "H" and are made of rolled steel plate. At the top of the guard is a piece of plate steel

Ransom Style H Guard for Snagging Wheel Grinders

¾ in. thick, which is lowered as the wheels wear down in diameter. This part protects the operator if the wheel should break. It is supported by 2½ x 1¼-in. steel bars riveted to the side plates and is held in position by a clamping screw. All adjustments are accomplished with this piece, and therefore it is not necessary to move the guard itself at any time.

The door is hinged and held shut by malleable iron latches, instead of nuts. A suitable cast-iron cover protects the end of the arbor and nut. The exhaust pipe opening is at the back of the guard in such a position that the bond or dusty part of the refuse is carried off directly without clogging the apparatus.

The lower front part of the guard is made removable. It is left on when work is being ground, using a rest. But when no rest is used, this part may be removed and gives free access to the wheel.

These guards conform to the Safety Code issued by the American Engineering Society. They are made in the following sizes: 16, 18, 20, 21, 24, 27 and 36 inches.

"U. S." Combination Blower and Vacuum Cleaner

Cleaning apparatus that does double duty about the shop is now available through the United States Electrical Tool Company, Cincinnati, Ohio. This tool not only provides a powerful suction for a vacuum cleaner, but also provides a blast of air to be used for blowing dust from machinery. The change from a vacuum cleaner to a blower is done by simply removing the dust bag and changing the location of the hose.

By hanging the motor and fan over his shoulder, the operator can get into places difficult of access, and the weight of the device is not so great as to become tiresome. The cleaner comes in two sizes complete with hose, nozzle, brush, canvas bag and shoulder strap. The No. 1 size weighs 7½ lb., and the No. 2 size

"U. S." Combination Blower and Vacuum Cleaner

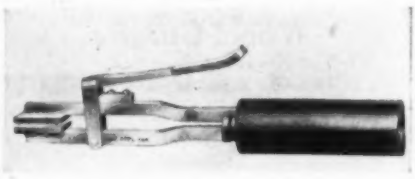
weighs 9½ lb. Among the features are a universal motor, an aluminum body, and a quick-make and break type switch.

Wachs Metallic Electrode Holder

Light weight and good balance are features of the Wachs metallic electrode holder, placed on the market by the Northwestern Manufacturing Company, Milwaukee, Wis. The handle is round, fits the hand, and is ventilated so that the holder can be used continuously without becoming uncomfortably warm. A wedge holds the cable securely in place.

In place of a spring, the Wachs holder makes use of a simple compression lever. This lever has a protective covering and is locked in place by a roller operating against a fixed ratchet. Both the roller and ratchet are made from hardened tool steel and the jaws are of copper and are welded in place. Gripping surfaces are smooth and are free from corrugations. The rod is held at any desired angle.

Two sizes of the Wachs holder are available. The first is for electrodes from $\frac{1}{16}$- to $\frac{1}{4}$-in. in diameter inclusive, with capacity to carry currents up to and including 400 amp., and the second is for electrodes for $\frac{1}{4}$- to $\frac{1}{2}$-in. inclusive, and with currents between 400 to 800 amperes.



Wachs Metallic Electrode Holder

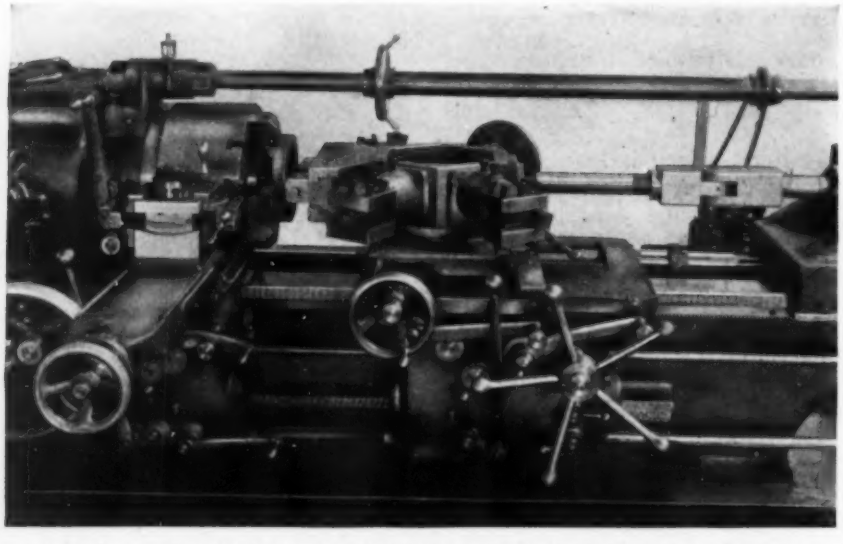
EQUIPMENT ADAPTATIONS

Recently Developed by the Makers

Rolling-In Valve Seats on a Gisholt No. 2L Turret Lathe

Several machines and operations used in the former processes of boring and shrinking-on of seat rings have been eliminated by the use of a special two-roller head on a No. 2L Turret Lathe manufactured by the Gisholt Machine Company, Madison, Wis. In this job the turret lathe faces and grooves a valve disk and, in addition, rolls in the seat ring, all in one chucking. The valve disks are located on a spherical boss in the chuck and tilted to the proper facing angle by a pusher disk in the hexagon turret. The same turret also carries tools for grooving the disk for the seat ring. In the square turret a forming tool cuts the dove tail, into which the seat ring is placed by hand prior to the rolling-in process which immediately follows.

The hexagon turret then indexes, bringing the special two-roller head into contact with the valve ring. About 20,000 lb. pressure is applied to the rollers by a special hydraulic ram, while the chuck revolves, thus rolling the ring accurately into position. A special ball thrust bearing of nearly the same diameter as the chuck, takes the rolling-in thrust. Although the machine has been subjected to this extremely high pressure daily over a period of months, the spindle, headstock, and bed castings still retain their original accuracy and rigidity.



Special two-roller head shown in position for rolling in valve seats on a Gisholt No. 2L Turret Lathe

Diamond Boring a Shock Absorber Housing

It has been said that the efficiency of the shock absorber, of which this housing is a part, is practically dependent upon the concentricity of the shaft hole and the body hole, the maximum tolerance for eccentricity

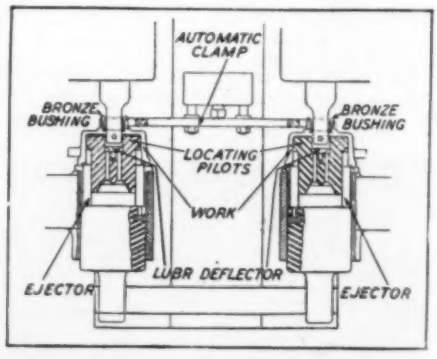


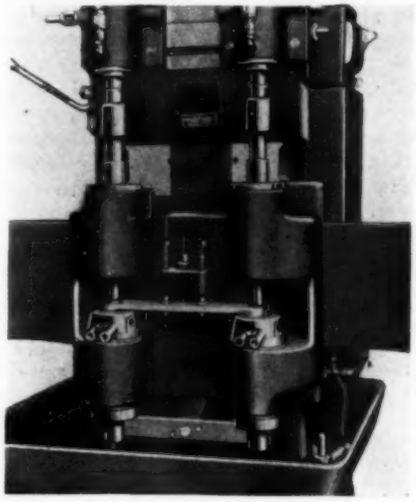
Diagram showing the method of automatically locating and clamping the work and also the automatic ejectors

Production Data

Part	shock absorber housing
Material	bronze bushing
Operation	finish bore bronze bushing
Bore diameter	1.000 in.
Bore length	1.0625 in.
Spindle speeds	4,000 r.p.m.
Feed	.0009 in.
Depth of chip	.005 in.
Limits	.00025 in.
Machine cycle	30 seconds
	2 pieces per cycle
Chucking time	5 seconds

on this piece being 0.0005 in. To attain this the part has been diamond bored on a Coulter double-spindle diamond tool boring machine manufactured by the Automatic Machine Company, Bridgeport, Conn. A close-up of the housing in position on the machine is given, together with a diagram showing the method of locating and clamping it automatically and the automatic ejectors. Production is about 160 pieces per hour.

It is claimed that by means of a simple and accurate one-piece fixture,

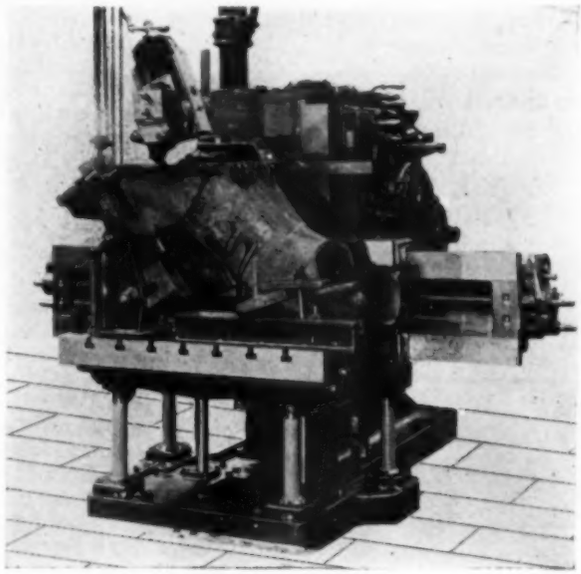


Showing the fixture arrangement on a Coulter Double-Spindle Diamond Tool Boring Machine with the boring bars in position for boring the shaft hole concentric with the body hole to 0.0005 inch

shown on page 712, the boring bars and work are held in alignment, giving true round holes of uniform accuracy and parallelism.

Morton Attachment for Shaping Locomotive Stoker Discharge Boxes

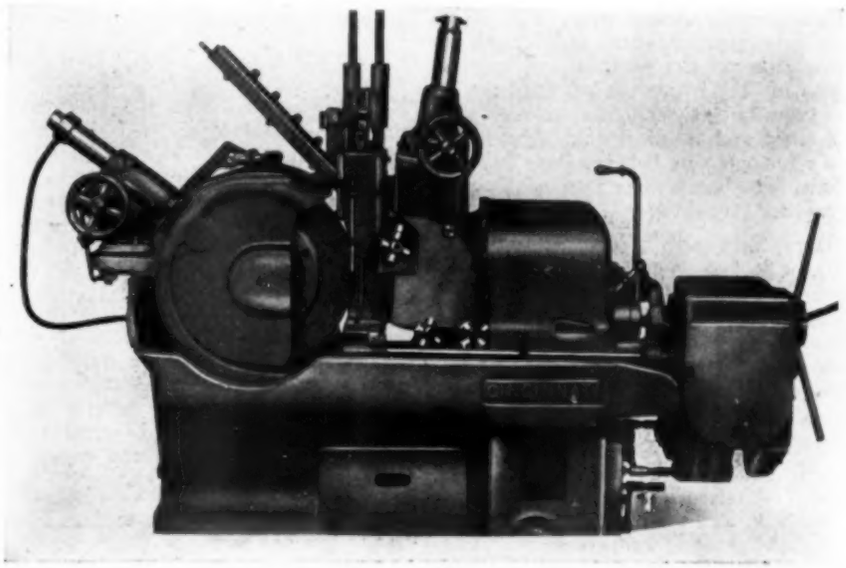
With the use of a special tilting attachment, a 48-in. stroke, high-duty, draw-cut shaper built by the Morton Manufactutring Company Muskegon Heights, Mich., has been employed for machining locomotive stoker discharge boxes. This machine has a 60-in. horizontal or side feed, a 27-in. vertical feed, and a distance of 41 in. between the ram and the lower table. It is equipped with power rapid traverse both horizontal and vertical. Four self-adjusting screws are provided for raising and lowering the table to insure alignment of the work at all times. The machine is driven by a variable speed transmission having 20 or more speed changes. Five shaping operations are necessary on this casting, all at different angles. The machine is furnished with standard equipment and when done with special work is used in production shaping and planing.



Morton 48-Inch Stroke, High-Duty, Draw-Cut Shaper machining a locomotive stoker discharge box by the use of a special tilting attachment

Grinding Universal Joint Knuckles by The Centerless Method

By means of a hydraulic loading and unloading fixture on a Cincinnati No. 2 centerless grinder, built by Cincinnati Grinders, Incorporated, Cincinnati, Ohio, two arms of knuckle centers for universal joints are ground simultaneously. The work is placed in an inclined chute and all succeeding operations are automatic. As the elevator part of the fixture rises, one piece of the work is released from the chute, passes by gravity to the work carrying fingers, and is lowered by action of the hydraulic cylinder to a slotted work support blade. The automatic in-feed attachment brings the regulating wheel forward and two arms of the spider are ground. As the regulating wheel backs away, fingers carry the piece upward. It is ejected into the receiving chute over the regulating wheel. A duplex grinding and regulating wheel arrangement is used—the spacer between the wheels



Grinding Universal Joint Knuckles on a Cincinnati No. 2 Centerless Grinder

allowing the rotation of the two arms not being ground.

Two grinding cuts are taken on these arms, the first being 0.008 in. and the finishing cut being 0.002 in. Production totals 170 pieces per hour, grinding four arms complete. This equipment makes it possible to grind work by the centerless method, although ordinarily it could not be loaded manually, due to interfering yokes, flanges, arms, and other parts.

TRADE PUBLICATIONS

BEARINGS, "HELIFLEX." The Roller Bearing Company of America, Trenton, N. J., has published catalog No. 40 on "Heliflex Bearings," which are helically wound, straight radial type roller bearings. After taking up the shock-absorbing characteristics, the roller assembly, and bearing mountings and housings, tables of data are presented on the sizes available in the various styles. The catalog contains 36, 11 x 8½-in. pages.

CENTRIFUGAL PUMP PRIMING. Barrett, Haentjens & Co., Hazleton, Pa., has published "Centrifugal Pump Priming," with notes on the theory of suction lift, suction losses, etc. Diagrams are given of the method of priming of various types of pumps.

CONVEYORS, BELT. The Stearns Conveyor Co., East 200th St. & St. Clair Ave., Cleveland, Ohio, a division of the Chain Belt Co., has published a catalog and engineering data book entitled "Rex-Stearns Belt Conveyors," which contains complete and specialized information on the designs and applications of Rex-Stearns Timken idlers for all types of belt conveyors, together with all allied and auxiliary equipment necessary for complete belt conveyor installations. The booklet is replete with photographs. It contains 96, 10½x7½-in. pages.

DIE SETS AND ACCESSORIES. U. S. Tool Co., Inc., Ampere, N. J., has published a catalog under the foregoing title showing a completely modernized line. Complete specifications are given for all styles of die sets and accessories. The catalog contains 30, 11x8½-in. pages.

FURNACES, ELECTRIC. The Ajax Electrothermic Corporation, Trenton, N. J., announces bulletin No. 6 describing various installations of Ajax-Northrup coreless or high frequency induction furnaces, and giving the design principles. The booklet is well illustrated throughout.

GAGES. The John-Sons Gage Works, Hartford, Conn., has issued catalog No. 4, entitled "Screw Thread Gaging and Measuring Tools." Notes are given on the selection of gages and descriptions of the various types. The catalog contains 47, 9x6-in. pages.

GEARS. The Charles Bond Co., 617 Arch St., Philadelphia, Pa., has issued catalog No. A54 on its standard stock gears.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has published two bulletins as follows: No. GEA-570B, superseding GEA-570A, on "Hand Starting Compensators" of the dead-front cabinet type for squirrel-cage, induction motors, and No. GEA-1142A, superseding GEA-1142, on the Type EW resistors for mine and industrial-haulage locomotives. Both pamphlets are printed on 11x8½-in. sheets.

INSTRUMENTS, OPTICAL. The Bausch & Lomb Optical Co., Rochester, N. Y., has published a booklet entitled "Precision Through Optical Methods," which illustrates and describes several new optical instruments, some of which are of use in metal working plants and the laboratories thereof. The booklet contains nineteen 9x6-in. pages.

LATHE TOOLS. The Ready Tool Co., Bridgeport, Conn., has published a folder showing various lathe tools, which include a ball bearing center, tool holders, milling machine dogs, and a safety type belt shifter.

MOTORS. The Triumph Electric Corporation, Cincinnati, Ohio, has published bulletin No. 2015 on its type "TR" self-start motor, which develops torques up to 300 per cent of its normal rating on starting. A cross-sectional view is given, performance characteristics are shown, and the machine is clearly described.

NICKEL ALLOY STEEL. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has published bulletins No. 15 and 16, entitled respectively "Nickel-Chromium Steels for High Temperature Service — Valves and Bolts," and "Approximate Relations Between Brinell, Rockwell, and Shore Hardnesses and the Tensile Strengths of Structural Alloy Steels."

NICKEL CAST IRON. The International Nickel Co., Inc., 67 Wall St., New York, has published "Notes on Uses of Nickel Cast Iron," which lists the recommendations for the use of the material in the automotive, aeronautical, general machinery, machine tool, and power industries.

PUNCHES, PLATE SHEARS, ETC. Henry Pels & Co., Inc., 90 West St., New York, N. Y., has published catalog MC-30, completely covering its line of combination punches, plate shears, angle, bar, and tee cutters, and notchers or copers. Complete specifications for the various models are tabulated.

SHAPERS, "STEPTOE." The Western Machine Tool Works, Holland, Mich., has published catalog No. 80 on the "Steptoe" shapers equipped with Timken roller bearings. It gives complete descriptions, illustrations, and cross-sectional views of the 14-, 16-, 20-, and 24-in. sizes. Specifications are included. The catalog contains 24, 11x8½-in. pages.

EMPLOYE SUPERANNUATION. The National Metal Trades Association, Committee on Industrial Relations, 122 South Michigan Ave., Chicago, Ill., has published a booklet, "Meeting the Cost of Employe Superannuation." The booklet takes up various pension plans and the cost of each. It gives a list of conclusions developed from this research. The booklet may be obtained from the above for $0.75 a copy.

ENAMELS FOR SHEET IRON. The University of Illinois, Engineering Experiment Station, has published bulletin No. 201 entitled "Acid Resisting Cover Enamels for Sheet Iron," which gives the results of an investigation on the composition of various enamels and contains a description of the processes involved in the preparation of enamels and the details of tests made to determine the resistance to acids.

FOREIGN COMMERCE HANDBOOK, 1930-31. The Foreign Commerce Department of the Chamber of Commerce of the United States, Washington, D. C., has issued a bi-annual pamphlet giving a list of the leading sources of export and import service in this country.

SAFETY ADVERTISING. The Metropolitan Life Insurance Co., Policyholders Service Bureau, 1 Madison Ave., New York, N. Y., has published No. 6 of the "Industrial Safety" series entitled "Safety Advertising." The booklet deals with the various highlights of this division in accident prevention work and is devoted to a discussion of principles, form, appeal, and media of advertising as applied to safety.

WELDED PIPING DESIGN, FABRICATION OF. The Linde Air Products Co., 30 East 42nd St., New York, N. Y., has published a booklet entitled "Fabrication of Welded Piping Designs." Data are provided for the executive, welding foreman, and welder to enable them to apply successfully the fundamental welding designs and carry through any piping projects with efficient methods and assurance of satisfactory results. Three parts are included: Part I, Procedure Control; Part II, Templet Layout for Pipe Fittings, and Part III, Tables for Estimating Costs. The pamphlet contains 86, indexed, 9x6-in. pages.

NEWS
OF THE WEEK

Washington Looks at the Tariff—More Machinery by Barge Line

By Paul Wooton

Washington Correspondent, American Machinist

WASHINGTON, D. C., April 23—The machine industry stands to gain but little from the tariff bill, now shaped in essentially its final form as concerns the metal schedule. However, the industry is in no position to criticize Congress for being remiss in considering machine items on a parity with other domestic products. In almost every major case in which a machinery or machine-tool manufacturer came to Washington and made a strong plea before the House and Senate committees, some tariff support was granted. For example, knitting machines, timepieces, gear hobbing machines, and several others were given reasonable raises, perhaps not as much as was asked, but nevertheless a substantial aid against foreign inroads.

Thus, in the opinion of Washington observers close to the situation, it is obvious that the machine industry gained where individual interests made themselves heard but lost on elements of importance to the trade as a whole for the old reason that "everybody's business was nobody's business." The most serious loss was the reduction in the basket clause rate on all machinery and parts not specially provided for, affecting imports in the magnitude of ten millions of dollars per annum. The duty in force since 1922 is 30 per cent and that proposed is 27½ per cent ad valorem. This would lower the customs collections by a quarter of a million dollars.

It will be remembered that for some time under previous tariffs the basket clause rate was 45 per cent which dropped during the Underwood Act. In restoring a high level under the Fordney-McCumber Act in 1922, a scheme was advanced to set temporary duties in order to strike tariff bargains with foreign powers. The machine industry advanced 30 per cent as its minimum rate and, when the bargaining scheme was discarded, this minimum stuck due to lack of pressure to force it back up to the pre-war 45 per cent. Under these circumstances, it is felt that an increase was in order this time rather than the decrease.

Commerce reports show a steady increase in the volume of shipments from abroad which, while not of vast significance compared to the industry as a whole, undoubtedly concentrate on many specialized branches and firms. "Chinese copies" of American machinery are becoming an especially serious problem and are helping to swell the tide of imports. Entirely forgetting the lower wage and material prices in foreign countries, it is obvious that copying upsets the advantages of efficiency itself. A rough check by a U. S. commercial attache in Berlin showed 64 American machines which the Germans were copying almost identically.

With the bill so near the final vote, it seems unlikely that anything will be done to correct this condition. After the bill becomes law, there will yet be time to ask the Tariff Commission for a better basket clause rate. In a specific case where copying violates the rules of fair business practice, it might be possible to invoke the presidential powers granted under Section 316 of the existing law. This provides the right to stop entry of imports which are on an unfair basis. The section has been upheld by a court decision.

At present, the tariff bill is being subjected to rapid revision by the conference committee between House and Senate. This process probably will be finished before the end of this month. Then comes the final debate with a

New Tariff Rates on Machinery and Related Items

These include the latest Joint Conference Committee changes on the more important items of interest to the machine trade.

Paragraph numbers are those of the Senate bill.

The term "N.S.P.F." means "not specially provided for."

Duties are listed either in cents per pound, or in percentages of value, (ad valorem) or both.

Paragraph	Item	Rates	
		Existing	Proposed
307	Boiler plate, iron or steel valued at not above 3 cents per lb	7/20c.	5/10c.
318	Fourdrinier wires	35%	50%
319b	Autoclaves, catalyst chambers, etc.	40%	35%
325	Anvils weighing 5 pounds or more each	1½c.	3c.
327	Cast iron pipe	20%	25%
	Moulders patterns of whatever material composed for the manufacture of castings (formerly 40% if metal and 33⅓% if wood)	....	50%
339	Aluminum: utensils	11c. plus 55%	8½c. plus 40%
374	scrap	5c.	3½c.
	sheet	9c.	7c.
353	Electrical machinery and appliances	40%	35%
358	Additional duty on razors and parts, other than safety razors, in addition to specific rates	45%	30%
361	Pliers except slip joint and wire splicing:		
	Value not over $2 per doz.	60%	5c. ea. plus 60%
	Value $2 per doz. and over	60%	10c. ea. plus 60%
365	Shotguns and rifles valued over $50	$10 each	20%
367 / 368	Watches and clocks adjusted to rates intermediary between those proposed by House and Senate and slightly higher than existing law.		
369	Automobiles, n.s.p.f.	25%	10%
372	Steam turbines	15%	20%
	Full-fashioned hosiery knitting machines	35%	40%
	Textile machinery, n.s.p.f.	35%	40%
	Acetylene generating machines	40%	20%
	Machines for cutting or hobbing gears	30%	40%
	Punches, shears, and bar cutters for fabricating structural or other rolled shapes	30%	40%
	Machinery n.s.p.f. and parts	30%	27½%
396	Print rollers for stamping or cutting designs and with raised patterns of brass or felt	60%	$5 ea. plus 72%
	Embossing rollers	60%	30%
397	Hand drills, planes, chisels, etc	40%	45%
352	Metal cutting tools, n.s.p.f.	40%	50%
398	Articles or wares of any base metal, n.s.p.f	40%	45%
304	Additional duty on hollow bars and hollow drill steel valued over 4 cents per lb	....	¼c.

(See also tables on Schedule 1, Chemicals, Oils, and Paints, and Schedule 2, Earths, Earthenware, and Glassware.)

reasonably quick settlement followed by adjournment of Congress close to the first of June, barring unforeseen developments.

Other changes in the metals schedule, probably in their final form, are shown in the accompanying table.

PERSISTENCE of commodity prices in continuing their upward tendency is accepted more generally as an indication that the long swing downward has come to an end. This is expected to be encouraging to business and is thought by many to indicate that the level of business through the summer will be higher than was at first anticipated. There is nothing in the situation, however, to give assurance of any unusual pickup in the volume of business until Fall. Money continues easy and the volume of mortgage loans are increasing, but a relatively small amount of it appears to be going into residential construction.

A DECLINE in traffic on the Mississippi Barge Line for 1929 over 1928 is revealed in the annual report of the Inland Waterways Corporation, recently made available. Barge line officials, however, are not disheartened, but for the fact that one of the worst low water stages ever encountered on the river prevailed during the summer months, they state that 1929 would have been a record year. They are particularly jubilant over the industrial trend that the traffic is taking.

The general shifting of the traffic from bulk commodities to manufactured articles and industrial goods is regarded as an encouraging development. It is a sign that the industrial sections in the upper valley section and in the Great Lakes territory are becoming waterway-minded. It is shown in the report that despite losses in the aggregate of traffic handled, large amounts of automobiles, tractors, agricultural implements, machinery and boilers, iron and steel manufactures, and other industrial articles were carried.

QUICKER action on patent and trademark applications and protection against the unscrupulous practices of unauthorized attorneys are the objectives of two bills which passed the House on March 17. An increase from $20 to $25 in the basic fees charged for receiving and granting patent applicatios and from $10 and $15 in the trademark fee authorized in the bill sponsored by Representative Vestal will permit adding 110 patent examiners and 30 clerks to the personnel of the Patent Office. Thomas E. Robertson, Commissioner of Patents, estimates that the provision for a larger staff will enable the Patent Office, in two years' time, to reduce to three months the time which now elapses before patent applications are taken up for action.

The second bill, sponsored by Representative Cramton, declares it to be unlawful for any person to represent himself as a patent agent or patent attorney unless he is recognized to practice before the Patent Office. The bill also provides that no corporation or association may be admitted to practice.

A PLEA for retention in the conference bill of the flexible provisions of the tariff was made to Representative Hawley, of the conference committee, by H. H. Rice, chairman of the Legislative Committee of the National Automobile Chamber of Commerce. In his letter Mr. Rice says:

"With the development of its world trade, the motor industry is constantly confronted with serious tariff questions such, for example as are now pending in France and Germany. Other industries frequently find themselves in similar positions.

"Tariff conditions are not static and we believe that there should be opportunity for tariff adjustment in the periods between the consideration by Congress of the general tariff bill."

DEBATE over the propriety of the Federal Trade Commission's conference method for promoting self-regulation of business grows more spirited as the number of industries calling upon the commission to serve as their official arbiter increases. Because the step between co-operative action for the elimination of trade abuses that justly merit condemnation as unfair methods of competition and similar agreements for regulating production, fixing prices, and other illegal practices is so short, some people say the Federal board is fomenting conspiracies in restraint of trade. Staunch defender of its own system, the commission maintains that the codes adopted under its auspices are doing more to promote good sportsmanship in industry than any number of complaints or stipulations in which the commission acts as umpire under its statutory authority.

The commission holds no protecting arm around the industry that doesn't play ball, and if, as reported rather widely, groups which have adopted codes for eliminating unfair and uneconomic practices are using them as a cloak for price fixing, it is probable that sooner or later they will be hailed into court by the Department of Justice.

AFTER years of discussion and planning, the first nation-wide census of merchandise distribution is actually in the making. Gleaned from 2,000,000 outlets, the information tabulated by the Census Bureau will present a larger statistical picture of business than has ever before been drawn. Approximately 300,000 returns already have been received. These have come in principally from the rural districts. The census covers a year already passed. In order that its contribution to improving distribution methods may not be diminished by delay, the Bureau will issue preliminary reports by states, counties, and cities as the canvas is completed, presenting the fundamental information concerning the number of outlets by store classifications.

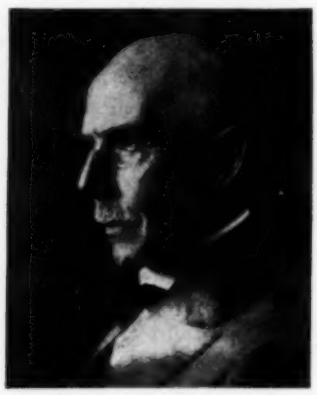
* * * *

Findley Resigns as Iron Age Editor—Macon to Succeed Him at Once

ALVIN I. FINDLEY, whose broad knowledge, sound judgment, and penetrating analytical faculties have contributed conspicuously to the upbuilding of *The Iron Age*, announced his resignation as editor-in-chief of the paper in the issue of April 17th. Simultaneously, the appointment of William W. Macon to succeed Mr. Findley was announced by F. J. Frank, president.

Both men have been prominently identified with the publication for many years, Mr. Findley for 25 years, most of the period as editor, and Mr. Macon for 19 years, the last 12 as managing editor. Mr. Findley will continue as editor emeritus. G. L. Lacher will become managing editor.

WILLIAM W. MACON



ALVIN I. FINDLEY

A.F.A. Announces 33 Papers For Fourteenth Session

AN UNUSUALLY extensive program both in technical papers and in shop discussions has been announced for the annual convention of the American Foundrymen's Association in Cleveland from May 12 to 16. The exhibition in connection with the convention opens at 12 noon on Monday, May 12, when registration will also begin. A business session is scheduled for the first regular meeting and the first shop operation course on gray iron will also be held at 4 o'clock on the same day. A reception will be held at 8 o'clock Monday evening by the Cleveland Committee.

The exhibition will open at nine on the following morning and the first of the technical sessions will begin an hour later, continuing until late in the afternoon when shop operation courses on steel, gray iron, and non-ferrous metals will be held. The Annual Exhibitors' Dinner is scheduled for Tuesday evening. Sessions will continue on Wednesday and Thursday with shop operation courses at 4 o'clock each afternoon on the same subjects. The A.F.A. Annual Banquet will be held on Thursday evening, the exhibition being closed at 5 o'clock to allow everyone to attend. Two sessions will be held Friday morning to complete the program and the exhibition will close at 5 o'clock that evening. Technical sessions are as follows:

Tuesday

Foundry Costs

"A Recommended Standard Cost System for Gray-Iron Foundries," by J. L. Carter, Sacks-Barlow Foundries, Inc., Newark, N. J.

"Organizing a Nonferrous Foundry Cost Group," by C. S. Humphries, Westco Chippewa Pump Co., Davenport, Iowa.

Malleable Founding

"Continuous Melting Process as Applied to Malleable Iron," by B. R. Mayne, Saginaw Malleable Iron Div., General Motors Corporation, Saginaw, Mich.

"Factors Affecting Machinability of Malleable Cast Iron," by H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland.

"Some Features of the Pulverized-Coal-Fired Air Furnace," by E. F. Wilson, Jefferson Union Co., Lockport, N. Y.

Round Table—Malleable Iron Founding

Chairman, P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill.

Cast Iron—Metallurgy

"Effects on Cast Iron of Prolonged Heating at 800-1,100 deg. F.," by R. S. MacPherran and R. H. Krueger, Allis-Chalmers Manufacturing Co., Milwaukee.

"Blistering Tendency of Some Cast Iron When Enameled," by A. I. Krynitsky and W. H. Harrison, Bureau of Standards, Washington.

Non-Ferrous Foundry Practice

"Deep-Etch Test of Brass," by W. F. Graham and L. A. Meisse, Ohio Brass Co., Mansfield, Ohio.

"Application of Ingot Metal to Production of Brass and Bronze," by Wm. Romanoff and C. O. Thieme, H. Kramer & Co., Chicago.

"Overcoming Alloy-Ingot Troubles in the Brass Foundry," by Wm. S. Paulson, Thos. Paulson & Son, Inc., Brooklyn, N. Y.

Wednesday

Management

"Personnel Management," by Dr. Harry Meyer, Frigidaire Corporation, Dayton.

Gray Iron Foundry Practice

"Briquetting Cast Iron Borings," by H. Rayner, Dodge Bros. Corporation Division, Chrysler Corporation, Detroit.

"Continuous Melting from Cold Stock of Gray Iron in Electric Furnace," by N. L. Turner, Beach Foundry, Ltd., Ottawa, Canada.

"Methods for Determining the Volume Changes Undergone by Metals During Casting," by E. J. Ash, A.F.A. Research Associate, U. B. Bureau of Standards, Washington.

Non-Ferrous Founding

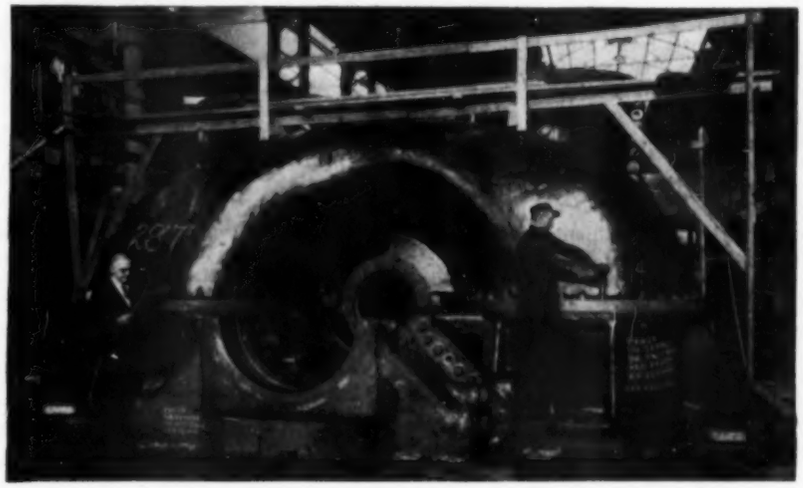
"Care and Maintenance of Fuel-Fired Furnace Linings in the Nonferrous Foundry," and "Selection and Use of Refractory-Maintenance Cement in the Nonferrous Foundry," by H. E. White, Lava Crucible Co., Pittsburgh.

"Stronger Aluminum Castings by Improved Foundry Practice," by E. M. Gingerich and H. J. Rowe, Aluminum Co. of America, Pittsburgh.

"Progress in the Die-Casting Industry," by Marc Stern, A C Spark Plug Co., Flint, Mich.

Sand Control

"Sand Control as Viewed from the Producers' Standpoint," by W. W. Kerlin, Enterprise Sand Co., Pittsburgh.



Generator end of the casing. The low-pressure element of the first of two triple tandem compound turbine generators being built by General Electric. Each is rated at 105,000 kw., generating 22,000 volts, running 1,800 r.p.m. at 600 lb. steam pressure

* * *

Management

"The Value of Sales Analysis and Market Research," by J. P. Newman, McGraw-Hill Publishing Co., New York.

"The Value of Cleanliness and Neatness in a Foundry," by Ed. Trapken, Sandusky, Ohio.

Thursday

Steel Founding

"Reclaiming Steel Foundry Sands," by M. D. Pugh, Illinois Testing Laboratories, Inc., Chicago.

Address by Geo. Batty, Steel Castings Development Bureau, Philadelphia.

"Australian Steel Foundry Practice," by D. Clark, Adelaide, Australia. (Submitted on behalf of the Bureau of Steel Manufacturers of Australia.)

Apprentice Training

"Foundry Apprentice to Apprentice Foreman," by E. H. Ballard, General Electric Co., West Lynn, Mass.

"Where are the Young Foundrymen?" by S. W. Utley, Detroit Steel Casting Co., Detroit.

Round Table—Steel Founding

Chairman, W. J. Corbett, Fort Pitt Steel Casting Co., McKeesport, Pa.

Round-Table—Nonferrous Founding

Chairman, H. M. St. John, Detroit Lubricator Co., Detroit.

Gray Iron—Metallurgy

"Carbon and Sulphur in the Cupola—Some Properties of Coke," by Jas. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

"Correlation of Tests for Cast Iron," by J. G. Pearce, Director, British Cast Iron Research Association, Birmingham, England. (Presented as the Annual Exchange Paper of the Institute of British Foundrymen.)

Friday

Materials Handling

"Continuous Core Ovens," by D. B. Hill, Palmer-Bee Co., Detroit.

"Materials Handling," by W. M. Booth, Syracuse, N. Y.

"Reducing Materials Handling Costs in the Jobbing Foundry," by F. C. Campbell, Eastern Corporation, New York.

Melting Furnaces and Core Practice

"Induction Furnaces for Ferrous and Nonferrous Metals," by Manuel Tama, Berlin, Germany.

"Value of Analyses and Specifications for Core Oil," by J. A. Gitzen, Lindsay-McMillan Co., Milwaukee.

"A Study of Nonferrous Crucible Melting," by H. E. White, Lava Crucible Co. of Pittsburgh.

The men who teach foundry subjects at engineering schools will get together on Wednesday evening, May 14, for their annual Foundry Instructors' Dinner, held in connection with the A.F.A. convention. This year the dinner meeting will be addressed by a well-known foundryman on the subject, "The Place of the Engineering Graduate in the Foundry Industry of Today."

"Carborundum" Is a Trade Mark

The Carborundum Co., Niagara Falls, N. Y., in its campaign against the growing tendency to treat the word "Carborundum" as a common or generic noun, has announced that the word is a trademark of the company, registered in the United States and foreign countries and is applied by it to its range of products. The Carborundum Company states that the proper term is silicon carbide and that this is the form that should be used unless a specific Carborundum brand product is referred to. If the word "Carborundum" is used it should always begin with a capital letter and be put in quotation marks to denote its trade-mark significance.

BUSINESS · BAROMETER

Usual spring business advance should be evident soon, with encouraging signs appearing in many fields

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

THOSE who had hoped that the political unity of the world would be increased by the Naval Arms Conference may have been disappointed, but in almost every newspaper there is evidence that its economic unity is steadily becoming closer. There can be no doubt that civilization is bound together by bonds of economic self-interest, and that in commercial or financial matters the injury of one nation speedily becomes the concern of all.

This is shown by what happened last week when the Ghandi revolt in India commenced to take formidable shape, and the Tokio Stock Exchange was compelled to close for a day because of a decline in the shares of one of Japan's largest corporations and a business depression which in last analysis is largely due to the decline in silk to pre-war prices.

As soon as these two happenings were known in the Occidental world, the commodity markets commenced to decline. The stock market became relatively quiet, and speculation generally relapsed into dullness.

This is not to say that there has been any further decline in domestic trade, but the overtones heard on the Stock Exchange quickly become audible in commercial quarters and the experience of last autumn has made many willing to believe that a booming stock market is essential to the maintenance of American prosperity.

This is not the case, but it will take time to convince people that dullness on the Stock Exchange is not incompatible with prosperity, and a period of comparative quietude seems to be ahead of the securities markets.

Scarcity in mortgage money previously alluded to in these letters continues. This may seem surprising in view of easier credit conditions, and it is probably a matter of rates, for if borrowers were still willing to pay as much for mortgage money as they did last year they would probably be offered all they could use. Be that as it may, it is said that some of the building planned for the coming summer will be deferred until loans are easier to obtan, and that expectations of an active building boom may be disappointed.

This is about the only untoward feature in the financial outlook. Brokers' loans are increasing rapidly, but the Reserve System is not presently disposed to try to halt them because it wishes to give business expansion free rein. Money is abundant, and the huge bank consolidations recently consummated assure accommodation for those large borrowers who are entitled to it.

A cut of four cents in copper has probably been the most sensational development in the week's commodity markets. Though it is ascribed to a "buyers' strike," it need not have surprised those who followed the views expressed in these letters for some time past. Copper was too high, and at 18 cents a reduced consumption seemed to be a certainty. But the decline in copper has added another to the list of staple commodities that are now subnormally low. They include sugar, silk, rubber, cotton, cocoa, possibly coffee, and some others.

Cotton has been depressed by rumors of a settlement between the Co-ops and their market antagonists, as well as by telegrams from the South which tell of good progress in putting in the crop under conditions that are mostly favorable. The telegrams are probably accurate, but nothing is known of the policy that the Government intends to pursue, and until some official announcement is made it will be dangerous to trade in the old crop positions.

New crop deliveries have also shown a declining tendency, and if October or December approach 14 cents they would seem to offer an attractive opportunity to the speculative investor, as well as to the manufacturer who is disposed to anticipate his next year's requirements.

Tenders on May contracts are expected to approximate 300,000 bales.

This is not to say that there is any lack of interest in new crop cotton. Uncle Sam's manipulation of the near positions has advertised the cotton exchanges immensely, and an early resumption of activity seems inevitable. When it arrives it is more than likely to spread to the other commodity markets where the important staples that civilization requires can be bought at or below the cost of production.

A recognition of this fact in the price trend seems to be probable, and when it comes it will be hard to resist the speculative urge that generally accompanies such movements.

In industry the most encouraging signs are a definite though careful increase in automobile and tire manufacture and reports that dealers' stocks of both have now been reduced to a healthy size. Steel business lacks buoyancy, but the output at around 75 per cent of capacity is apparently being sold, and production is well maintained.

The usual spring advance in business ought to be evident soon, and if it is restrained so that some think it disappointing the outlook will be all the better for the fall.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

UNCERTAINTY continued to be the predominating factor in the machinery and machine-tool markets of the country during the past week, most sections reporting quiet conditions. Chicago, Buffalo, Detroit, and Cleveland, however, reported improvement in some divisions of the field, indicating prospects of general improvement soon. The first quarter of the year corresponded with the first quarter of 1928 for most manufacturers and dealers, giving business enough to "get by," but only about half that of the same quarter of last year. Inquiries are showing signs of a decline, but this creates no cause for worry.

NEW YORK dealers report the market listless, with export orders showing well. The Philadelphia market is uncertain, orders being principally for replacements. Buffalo expects April to be far better than any month so far this year. Cincinnati manufacturers report the market sluggish, dealers report it unchanged. Sales there have been for single items for replacement. Chicago sales increased, as did inquiries, railroads displaying interest.

DETROIT seems at last to be pulling out from under the storm clouds, the atmosphere seeming to indicate more optimism—and future business. Cleveland automatic machinery manufacturers reported substantial sales to automobile builders; other manufacturers also report improvement. New England is in the grip of a "long, hard, pull" but expects to be out of its clutches this year.

Copyrighted
Theodore H. Price Publishing Corporation
95 Broad St., New York

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

The machinery and machine-tool market of the New York district maintains its listless attitude, showing only slight indications of the much-heralded spring improvement. Most dealers report that April will exceed March, but not by any surprising amount. The first quarter of the year in most cases was about equal to the same period of 1928, which places it about 50 per cent under the same period of last year. Most concerns, however, have budgets requiring only business of 1928 volume, and they will consequently keep their accounts on the black side of the ledger in spite of the prevailing listlessness.

Inquiries, so prolific for many weeks past, have slowed up, although those now being received indicate business in the near future. There have been several good export orders in the past week, and several of the dealers report striking improvement. The prevailing slowness is attributed generally to Congress's present efforts to attain front-page publicity of the vote-getting sort rather than to do anything constructive with regard to the business situation.

PHILADELPHIA

The immediate future of the machinery and machine-tool business continued to be uncertain in the Philadelphia market this week. The expected increase in sales and the general bolstering up of the trade which had been anticipated earlier in the Spring have not yet materialized, leaders of the industry declared, adding that it now appears it will be later in the season before any material increase in the volume of sales may be predicted.

The Chicago, Milwaukee & St. Paul Railroad has made some inquiries of Philadelphia manufacturers for tools and shop equipment, but so far as could be learned the Eastern carriers have not indicated any immediate intention of entering the market.

Sales reported by machinery producers this week were for replacements, with inquiries rather slack.

BUFFALO

The first real signs of improvement in the machine-tool trade in this district are now being reported. Undoubtedly, April will be a much better month than any in the first quarter of the year, perhaps markedly so.

Reports are still conflicting, however, and the upward trend is by no means uniform. Some dealers report more business being closed on the many inquiries which have been floating around than in some time. The buying just now seems to be in no particular industry or group, except that it appears to be that most sales are being made to manufacturers with national distributions.

In the electrical field, conditions are not so good. They are still far below normal locally, orders being small and scattered. While buying of electrical equipment in Buffalo for many months has been in the nature of small orders for individual pieces of equipment going to a wide variety of users, the present buying is not widely distributed and that which exists is still of the small-order type.

Conditions generally are improving. The aircraft industry seems to be hitting its stride. The management of the Consolidated Aircraft Corporation revealed to the writer that this company had booked more than $4,500,000 in orders so far this year, and prospects for further business are still good.

Conditions are also good in the automobile field. It is reported that Pierce-Arrow has stepped up its production.

CINCINNATI

Reports of almost all of the machine-tool manufacturers of the Cincinnati district agree that the general market was disappointingly sluggish the past week. In a few instances there was a slight gain in sales, but as a whole, there was no change of importance.

The greater part of the week's buying was done by general machinists and miscellaneous users, whose purchases were largely confined to single tools and replacements. This business was well scattered over the country, and the orders were well diversified as to sizes and types of requirements. No business of importance was booked from large users.

In speaking of inquiries, one manufacturer said: "Not for a long time have we received as many inquiries as are coming in at this time, and because of this fact we feel very much encouraged as to the future." Others report the receipt of a fair volume of well-diversified inquiries in the week, from all sections of the country, the requirements in most cases being for single tools and replacements.

Selling agents report the market in local and adjacent territory has undergone practically no change. Demand is fair, and there are at least some signs that conditions are about to become more favorable.

CHICAGO

Business in machine tools during the week developed a distinct improvement, and the belief is generally shared that the low level recorded for the first quarter of the year has given place to one of a much more satisfactory character. This is indicated by an increasing number of inquiries for a variety of shop equipment, large tools and small. The Chicago representative of one of the largest machinery producing plants of the East, whose territory covers several midwestern states, informed the writer that the actual sales by his branch from April 1 to 15 exceeded those for the entire month of March, and that he expects the ratio of increase to continue throughout this month. Other concerns report a slow though definite improvement for the first half of April. Railroads are gradually closing on most of the items in lists now in circulation, but new lists are being received. The Milwaukee Road within the last week has made inquiry for prices on 23 items needed for its shops, several of which are of heavy-duty type. The Chicago Board of Education is in the market for about 25 metal-working machine tools, of which 18 are lathes. These are required for the electric shop and the machine shop of the Austin High School. Manufacturers of farm implements and tractors continue as moderately active factors in the market. Demand for used tools in first-class condition shows considerable improvement.

DETROIT

Sales of machinery and machine-tools in the Detroit district have improved noticeably within the past ten days, but the increase is by no means general. A few dealers in specialized equipment report substantial gains and one or two dealers in standard machinery have also marked up some good sales. In general, however, there is still a pronounced feeling of apathy on the part of the automobile manufacturers.

The automobile industry is showing more activity than it has in many months, and the engineers are making plans for increased production and for improvements and betterments in design. A large percentage of the orders that have been placed within the past ten days or two weeks has come as the result of the need for replacements. Several of the larger contract jobbing shops are placing orders for tools and tool-room equipment. Most of these shops have been either entirely or almost entirely shut down for several weeks but have been receiving orders from the automobile companies recently.

There seems to be a general improvement in the atmosphere, and business men and industrial leaders are more optimistic than they have been. There are many indications that business is improving. Employment is increasing in the automobile plants, and this naturally brings about a better feeling throughout the entire commercial and industrial structure here.

CLEVELAND

The only outstanding feature for the past week has been the increase in sales registered by automatic machinery manufacturers who were the recipients of some substantial business from the automobile industry. This fact alone that the automobile manufacturers are buying tools is indicative that business is on the mend. April to date has been much better than any preceding month of the year for this division of the industry. Punch, shear, and planer producers also report improvement in sales. Dealers, on the other hand, complain that business is at a low ebb.

The announced plan of the American Steel & Wire Co. to spend $2,000,000 for additional new buildings, a major part of which will be used to house a building for the manufacture of automobile fenders and metal furniture, is of interest to the trade, as it is destined eventually to mean some large orders for machinery.

NEW ENGLAND

A continuation of the moderate level of machine-tool business which has featured the market since November has passed into the second half of April without notable change. Distribution in this territory does not uphold expectations resulting from several months of encouraging inquiries, nor is it discouraging. All improvement has been slow, and the upward trend of the long hard pull variety.

An executive describes the situation as being true to the natural trend of affairs following any extended period of full production.

The current week was much like its predecessors. Orders for new machines were for lone units. Municipal buyers figured in the buying, and in view of the number of orders noted, business was fairly well distributed.

"What's Ahead" to be Chief Topic At U. S. Chamber Meeting

THE eighteenth annual meeting of the Chamber of Commerce of the United States, to be held in Washington April 28 to May 1, will bring together business men from all sections of the country to discuss the general subject, "What's Ahead for Business." Business executives, economists, and government officials will analyze present economic trends and forecast their possible results. In addition to the general sessions of the meeting, eleven round-table conferences will take up for intimate discussion the trends within more limited fields, such as construction, transportation, waterways, banking, taxation, industrial developments, exporting, trade practice conferences, national resources, retailing, and insurance.

The meeting will open on Monday morning with the annual meeting of the National Counsellors of the Chamber and the remainder of the day will be taken up with business meetings. The 10th annual banquet of the American Section of the International Chamber of Commerce will be held in the ballroom of the Mayflower Hotel on Monday evening. Tuesday morning will bring the conclusion of the business sessions of the meeting and the opening of the meeting program with a keynote address by William Butterworth, president of the Chamber, on the title "Major Problems Ahead of Business." Six round-table discussions will be held that afternoon, included among them one on Exporting, in the small ballroom of the New Willard Hotel and one on Industrial Development, in the Spanish Garden of the Washington Hotel. A general session on Business Stabilization will be held that evening, following the dinner for the members of American Chambers of Commerce abroad.

Programs of the following two days will be similar in nature. Of unusual interest to metal-working executives will be the talk on "Stabilization of Production and Employment" by Howard Coonley, president of the Walworth Company, on Thursday morning, and Fred Sargent's discussion of "What to Do About the Nation's Tax Muddle," also on Thursday morning. The annual dinner Thursday evening at the Washington auditorium, with Richard F. Grant as toastmaster, will close the meeting.

* * *

Paris Fair to Be Held From May 17 to June 1

The 1930 Paris Fair will be held from May 17 to June 1 in the Exhibition Park of the Porte de Versailles, according to a recent announcement. The Fair is an annual event, comprising about 50 sections, including electric goods and machinery, furnishing trades, and special sections for agricultural machinery, iron and steel, acetylene equipment, and other metal-working industries. The section limited to electrical goods and machinery is 43,000 sq. meters (62,624 sq.yd.). The entire fair now occupies more than 40 hectares (100 acres) with 100,000 sq. meters (109,360 sq. yds.) of covered halls. The Paris Fair of 1929 included 7,392 exhibitors, among them 768 exhibitors from 33 foreign countries. The Fair was visited by more than 2,000,000 people last year.

The Fair has representatives in all countries from whom buyers and manufacturers may obtain required information. Inquiries are received in France by the Comité de la FOIRE DE PARIS, 23, rue Notre-Dame-des-Victoires, Paris.

* * *

Purchases by Soviet Rise 61 Per Cent in Half Year

Trade with the United States during the first half of the Soviet fiscal year ended March 31 totaled $98,000,000, according to figures made public recently by the Amtorg Trading Corporation, New York. The total indicates a gain of 61 per cent over trade carried on during the first half of the previous fiscal year. Purchases of American goods by the Amtorg and other Soviet trading companies in this country amounted to $77,159,000 for the half-year just closed, a gain of more than $30,000,000 over those of the corresponding period of 1928-29. A total of $56,700,000 was spent here for industrial, agricultural, and automotive equipment and supplies, according to the report.

* * *

Foreign Trade Convention Planned in Los Angeles

Some 2,000 delegates, representing 35 States and many industries, will attend the Seventeenth National Foreign Trade Convention in Los Angeles on May 21, 22, and 23. The general export and import business of the country will be scrutinized, especially as regards trade prospects with Latin America and the Far East.

The program includes addresses by Edward A. Sumner of the American Radiator Co., vice-president of the American Chamber of Commerce in France, on "Some Aids to American Business in Europe," H. G. Smith of the Bethlehem Shipbuilding Corporation, president of the National Council of American Shipbuilders, on "American Ships and Shipbuilding," and J. M. Eaton, general traffic manager of the Pan-American Airways, Inc., on "Commercial Aviation."

Other events will be a luncheon and group session by the American Manufactufers Export Association, a Trade Promotion Dinner, and a Trade Adviser Service with expert assistance from specialists throughout the foreign trade field. The feature of the opening night will be a World Trade Banquet with greetings from distinguished representatives from Japan, Latin America, and several countries in Europe.

* * *

Westinghouse Establishes Scientific Advisory Board

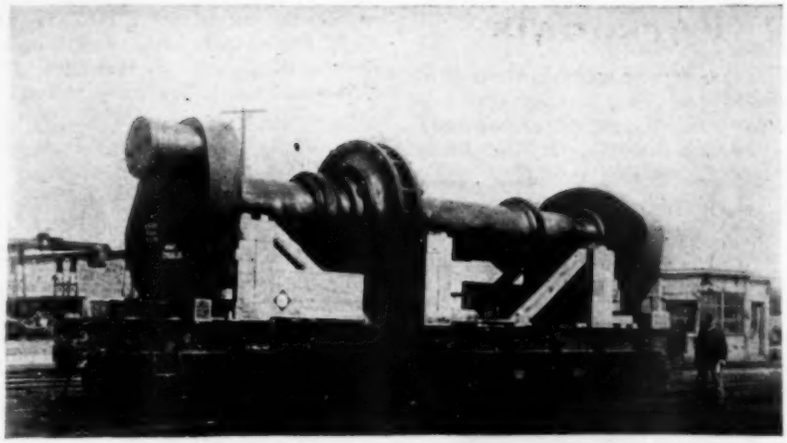
The first meeting of the recently created Scientific Advisory Board of the Westinghouse Research Laboratories was held in East Pittsburgh, Pa., on April 16. The aim of the board is to bring before Westinghouse specialists the latest and most advanced theories in the fields in which the board members are outstanding. Members of the board are: Dr. P. W. Bridgman, head of the Department of Physics, Harvard University; Dr. D. B. Waterhouse, head of the Department of Metallurgy, Massachusetts Institute of Technology; Dr. C. E. Mendenhall, head of the Department of Physics, University of Wisconsin; Dr. Stephan Timoshenko, head of the School of Advanced Mechanics, University of Michigan, and Dr. Edward Mack, Jr., Professor of Physical Chemistry, Ohio State University. It is planned to have the board meet three times a year, the individual members following closely all research work.

* * *

Taylor Society Meets on May 1

The spring meeting of the Taylor Society will be held in Columbus, Ohio, on May 1 and 2, with members of the Society of Industrial Engineers as guests. Sessions begin on Thursday morning, May 1, with a paper by Frederick L. Lamson, assistant to the president, Kendall Co., on "General Administrative Organization and Control." Simultaneous group discussions will be held on major sales problems of 1930 and basic conditions of effective utilization of facilities, the discussion being led by papers on these subjects by Frank R. Goodell and Leslie E. Bryant. A general session will be held in the evening, with Whiting Williams speaking on "The Industrial Relations Problem in 1930 and Its Solution."

Friday forenoon, three informal group discussions will be held, one on time and motion study, another on managing hand-to-mouth selling, and the third on functional organization of executive responsibility. Further discussions will be held in the afternoon, on maintenance of materials and equipment standards, developing new items and channels, and measuring and rating management. A general session on management problems of the next decade will be held in the evening, and this session will conclude the program.



The 133-ton crankshaft for a 6,600 kw. gas engine being built for the Illinois Steel Co., by Allis-Chalmers. This engine, producing about 10,000 hp., is said to be the largest of its type ever built

Business Items

The Baldwin Chain & Manufacturing Co., Worcester, Mass., and the Duckworth Chain & Manufacturing Co., Springfield, Mass., were recently merged, the new company to be known as the Baldwin-Duckworth Chain Corporation. The present factories in Worcester and Sringfield will be operated as separate divisions with administrative headquarters in Springfield. Officers are: president, George H. Empsall of Springfield; vice-presidents, Frank J. Weschler of Worcester, William E. Gilbert of Springfield, and W. F. Cole of Worcester. Mr. Weschler is also treasurer. Mr. Gilbert has been appointed sales manager of the Duckworth Division, and Arthur W. Warren sales manager of the Baldwin Division. The assets of the new corporation are reported to be somewhat over $2,000,000.

Consummation of negotiations for a site for the erection of a plant for the Hoyt Machine Co., of Indianapolis, which will be moved shortly to Mishawaka, Ind., has been announced by officials of the Mishawaka Chamber of Commerce. The Chamber has secured a complete title to the property which will be turned over to the company as soon as its new factory is completed and operations begun. Present plans call for the erection of a strictly fire-proof modern brick building to accommodate 14 automatic screw machines and 40 other fabricating devices.

The Vulcan Iron Works has completed the purchase of the Wallace Foundry Co., whose plant is situated on Granville Island, Vancouver, B. C. The Wallace company is said to possess one of the two largest electric furnaces on the Pacific Coast. The Vulcan Iron Works Company was recently reorganized and has now for head of the amalgamated concerns, M. Y. Aivazoff, president; J. H. Tourney, vice-president; Harry Stuart, secretary-treasurer; and General V. E. Odlum, director.

The Craft Saw Co., Oakland, Calif., is planning to build a fair-size factory in that city within the next six months for the manufacture of patented builders' power saws to be marketed under the trade name of "Craft Saws." The firm at present is occupying temporary quarters and engaged in assembling saws, parts for which are being made by local manufacturers. W. G. Foster and A. Rorstrand are partners in the enterprise.

The Green Bay Barker Machine & Tool Works, Green Bay, Wis., has taken over the complete line of drilling machines formerly manufactured and sold by the Rockford (Ill.) Machine Tool Co. The Green Bay Barker Works will continue this entire line, but will add a new line of all-geared vertical drilling machines and a new design of electro-hydraulic vertical and horizontal drilling machine, also a new line of assembled drilling heads.

The Dominion Welding Engineering Co., Ltd., which has its head office at Montreal and its main works at Lachine, Quebec, has decided to establish a branch in Toronto. This company is associated with the Dominion Bridge Company and its welding operations will be done for the present in the Toronto plants of the Dominion Bridge Company. Martin Stirling has been appointed manager of this new Ontario division of the Montreal company.

The Deep Well Tool Corporation, Ltd., Los Angeles, Calif., has been organized to engage in the manufacture and reconditioning of oil-well drilling tools covered by patents and patent applications owned by the company, according to a recent announcement by R. O. Pickin, president. The company, which has an authorized capitalization of $1,000,000, is completing plans for the erection of a completely equipped plant at Wilmington, to cost $150,000.

The Capital City Forging Works, Olympia, Wash., is starting a 100x80 ft. reinforced concrete and tile building at Fifth Ave. & Tilton Street. Equipment in the present building will be transferred to the new structure and new machinery will be added. A traveling crane through the entire building will be a feature. The building will have steel trestles all electrically welded. A. P. Platenberg is owner.

The Illinois Rail Joint Co., Joliet, Ill., of which D. H. Lentz, Jr. is president, has sold its equipment, machinery, and leases to the Hubbard Steel Foundries, Pittsburgh, Pa. The Illinois Rail Joint was established three years ago and according to Mr. Lentz there is a possibility that the Hubbard concern will expand the plant and production in the Joliet unit.

The Trane Co. of Canada, Ltd., Toronto, Ont., is installing a modern sheet-metal working plant and a machine shop for the manufacture of the Trane extended-surface concealed heaters, which hitherto have been imported from the parent company in Lacrosse, Wis. The company has purchased a 2½-acre site at Leaside, on the outskirts of Toronto, where a plant will be built eventually.

The Air-Land Manufacturing Co., Vancouver, B. C., of which W. E. Anderson, formerly of the Hayes-Anderson Co., Ltd., motor truck manufacturers, is chief stockholder, is erecting a plant near Vancouver to assemble flying boats. It is expected that the building, which will have a floor area of 100 x 110 ft., will be completed soon.

The Atlas Engineering & Machinery Co., Ltd., Toronto, Ont., has taken over the business of Fluid Gauges (Canada) Limited, Vancouver. The latter company was a manufacturer of service station equipment. The Atlas firm has moved about a carload of machinery to its Toronto plant.

Construction is expected to begin early this summer on a $2,000,000 seamless tubing plant which Page-Hersey Tubes, Ltd., propose building in Crowland, a suburb of Welland, Ontario. The new tube mill will employ 500 men and will produce yearly 50,000 tons of seamless tubing.

Officials of the Standard Steel Car Corporation, a Pennsylvania corporation, have filed papers with the secretary of state in Indianapolis qualifying the corporation to transact business in Indiana. The corporation manufactures cars, iron and steel and other metal products. Jacob S. White, Merchants Bank Bldg., Indianapolis, has been named the Indiana agent.

The Pusey and Jones Corporation, Wilmington, Del., has recently completed a woodworking shop and shipshed. The woodworking building is constructed of steel, brick, and cement and is 110x220 ft., two stories in height. The shipshed has 13 bays of 30 ft. each, making a total length of 390 ft. The total width is 138 feet.

Sutor & Co., 2008 East Slauson

Ave., Los Angeles, Calif., have been appointed representatives of the Foote Bros. Gear & Machine Co., 111 North Canal St., Chicago. The Los Angeles territory extends from the southern boundary of California up to a line just north of Bakersfield.

The Sly Machine Supply Co. property, 109-113 South St., Peoria, Ill., has been purchased by Murray M. Baker, who announced that the operation of the concern would be discontinued immediately. John C. Schleich, president of the company, negotiated the sale.

The Westinghouse Electric & Manufacturing Co., at its annual meeting in Pittsburgh recently, re-elected the following directors: Jerome J. Hanauer, W. L. Mellon, Geo. M. Verity, and F. A. Merrick.

The Inca Manufacturing Corporation, Fort Wayne, Ind., has been acquired by the National Electric Products Corporation of Pittsburgh and New York. The plant at Fort Wayne is now in process of being doubled in size.

The De Walt Products Corporation, Leola, Lancaster County, Pa., has acquired all rights to the Wodack electric hand saw and the Wodack combined mortiser and router.

The Atterbury Corporation, Black Lick, Pa., has started construction of a plant for the manufacture of oil-field equipment. The plant is expected to cost approximately $300,000.

T. J. Cope, Inc., Philadelphia, has been incorporated with $50,000 capital to manufacture and deal in tools, implements, and appliances.

The American Engineering Co. Philadelphia, has appointed the Hawkeye Supply & Manufacturing Co., Mason City, Iowa, as distributor in the State of Iowa.

The Atlas Steel & Supply Co., Cleveland, is said to be planning a one-story machine shop to cost approximately $50,000.

Canadian Warren-Pink, Ltd., St. Catherines, Ont., has decided to erect a factory in Vancouver for the manufacture of logging tools.

The Electric Machinery Manufacturing Co., Minneapolis, Minn., announces that the new Chicago office is in Room 1567, 20 North Wacker Drive Building.

The Chain Belt Co., Milwaukee, has recently appointed the Corbin Supply Co., Macon, Ga., as representative.

The Abell-Howe Co., is moving on May 1 to Suite 1130, 20 North Wacker Drive, Chicago.

National Cork Products, Inc., Detroit, has moved its plant to 1569 East Milwaukee Avenue.

The Modern Diamond Tool Co. has moved its factory and offices to 1050 Mt. Elliott Ave., Detroit.

The Hill-Clutch Machine & Foundry Co. has reopened its New York office, under the direction of A. L. Whiteside.

Personals

WILLIAM L. ALLEN, president of the Sheffield Steel Co., Kansas City, and VINCENT M. MILES, general counsel, were elected directors at the annual stockholders' meeting recently.

WILLIAM HENDRY BARKER has moved his New York office from 33 West 42nd St., to Suite 810 of the Graybar Bldg., at 420 Lexington Avenue.

LOUIS W. SUMNER
In charge Detroit Office, Bellis Heat-Treating Company

P. T. BROCKLEBANK has been appointed general superintendent of the J. P. Devine Co., Buffalo. Mr. Brocklebank was formerly connected with the Mt. Vernon, Ill., factory of the company.

ROE S. CLARK, assistant treasurer of the Package Machinery Co., Springfield, Mass., has been elected president of the Western Massachusetts branch of the National Metal Trades Association, to succeed LOUIS E. BAUER, former president of the Indian Motocycle Company.

LEE M. CLEGG has been appointed general sales manager of Thompson Products, Inc., Cleveland. Mr. Clegg began as stock boy and clerk in the production department eleven years ago.

W. GEORGE COOK, who for several years has been assistant sales manager of the New Jersey Asbestos Co., New York, N. Y., has been appointed special railroad representative for the Lunkenheimer Co., Cincinnati, with headquarters in Chicago.

ORVILLE COPPAGE was elected president of the Quick Welding & Machine Co., Terre Haute, Ind., at a recent meeting of the stockholders. M. I. LEEK was made vice-president and D. O. FERRAN, secretary-treasurer.

R. K. CUYLER, Lansing, Mich., has been named general manager of the Ray-Glo Corporation, Athens, Ohio. The company was purchased recently by FRED R. BEASLEY, Athens, and the Southern Ohio Power Company.

FREDERICK W. FREEMAN, Columbus, Ohio, and JOSEPH E. BREGG, Hamilton, Ohio, have been added to the board of directors of the Ralston Steel Car Co., Columbus, Ohio. Other directors were re-elected, including F. R. Symons, F. A. Livingston, L. C. Roy, Frank L. Stein, and Charles S. Younger, all of Columbus, and E. D. Kinne, Alliance.

DR. EDWIN C. GILBERT, general manager of the Chapman Valve Manufacturing Co., Indian Orchard, Mass., has been elected president of the Springfield (Mass.) Chamber of Commerce.

EUGENE HAHN has joined the Treadwell Engineering Co., Easton, Pa., in connection with that company's manufacture of a line of materials handling and storage equipment which he has developed.

A. L. HUMPHREY, president of the Westinghouse Air Brake Co., Wilmerding, Pa., and CALEB S. BRAGG, president of the Bragg-Kleisrath Corporation, have been elected directors of the Bendix Aviation Corporation, to succeed C. M. Keyes and J. C. Wilson.

W. B. KOCHENBERGER, formerly in charge of engineering and sales of the Lake Erie Engineering Corporation, Buffalo, was recently appointed chief engineer of the hydraulic machine department of R. D. Wood & Co., Philadelphia.

HENRY LIBKOWITZ of the Atlas Metal Co., Cleveland, is spending a month in Los Angeles.

FRED H. LUCAS has been appointed a structural engineer for the Illinois Steel Co. sales department and is now located in the Chicago headquarters at 208 So. La Salle St. He was formerly a contracting engineer for the McClintic-Marshall Co., Chicago.

MARTIN J. LUTHER has become special representative for the Monarch Machine Tool Co., in the Chicago and Milwaukee district with headquarters in the Chicago offices of Manning, Maxwell & Moore, Inc. Mr. Luther was formerly manager for the Kearney & Trecker Corporation, Milwaukee.

ROBERT P. J. MCCARTY has been placed in charge of the recently established New England office of the Associated Alloy Steel Co., Inc., Cleveland which is agent for stainless steels manufactured by the Ludlum Steel Co., the Sharon Steel Co., and the Timken Steel & Tube Co. The office is located at New Haven, Connecticut.

FRANK A. MILLER of the Buckeye Steel Castings Co., and FREDERICK MERRICK of S. O. Schoedinger Co., Columbus, Ohio, have been appointed to serve as arbitrators in commercial disputes in the Columbus territory submitted under the rules of the American Arbitration Association, of which LUCIUS R. EASTMAN is president.

HENRY I. POOR has been elected president and director of the Lafayette, (Ind.) Steel Products Co., to succeed J. F. BELLINGER, resigned. H. H. JOHNSON becomes vice-president.

ALBERT ROELLECKE, formerly of the New York office of Otto Weolfs & Co., and later vice-president of the Steel

Union Co. Inc., New York, N. Y., the American office of Vereinig-Stahlwerke, Dusseldorf, Germany, has resigned to become connected with Haleberger Huette, Brebach on the Saar, Germany.

JOHN B. SCHLOSSBERG, plant manager, the Highland Iron & Steel Co., Terre Haute, Ind., recently underwent a major operation at the Mayo Clinic at Rochester, Minn. He will return to Terre Haute about May 1.

EDWIN W. SMITH has been elected president of the H. B. Smith Co., Westfield, Mass., to succeed WILLIAM T. SMITH, who becomes chairman of the board. HARRY S. KIMBALL, former president of the Remington Arms Co., and JARVIS WILLIAMS, JR., former vice-president and general manager of the same company, have been elected to the board of directors of the Westfield company. Mr. Kimball also will serve the company in an executive capacity.

E. J. SMITH has been elected treasurer and general manager of the Lafayette (Ind.) Steel Products Co. H. E. WHITNEY has become secretary.

JOHN S. WALKER, JR., manager of the Huntington, W. Va., branch office of the Sullivan Machinery Co., Chicago, has retired to engage in the banking business in Huntington. He will be succeeded by Morley S. Sloman.

Obituaries

EDWIN H. LOCKWOOD, Higgins Professor of Mechanical Engineering in the Sheffield Scientific School of Yale University, one of the foremost mechanical engineering experts of the country, died on April 16, at New Haven, Conn. He was 64 years of age.

GEORGE F. WHITNEY, 83, secretary and treasurer of the Whitney Manufacturing Co., Hartford, Conn., died on April 13 following a long illness. Mr. Whitney was formerly connected with the Pratt & Whitney Co. and had been secretary-treasurer of the Whitney Manufacturing Co. since 1920. He had been with the company since its organization.

ROBERT H. MCNALL, retired president of the Gilbert & Barker Manufacturing Co., Springfield, Mass., died of heart disease on April 13 after a brief illness. Mr. McNall was 65 and had been president of the Gilbert and Barker company since 1912. He retired about a year ago.

JAMES W. BEAMAN, superintendent of the William E. Pratt Manufacturing Co., Joliet, Ill., since its establishment in 1902 until his retirement a year ago, died on April 10 in his home in Joliet.

ORLANDO GARRISON, proprietor of the Garrison Machine Works, Dayton, Ohio, died on March 28 at Dayton.

CLARENCE H. NORWOOD, 56, president of the Norwood Noonan Co., Chicago, and past president of the Chicago Engineers' Club, died on April 12 at his home in Chicago.

ROBERT M. ADAMS, late business associate of the Amthor Testing Instrument Co., Inc., 309 Johnson St., Brooklyn, died on Monday, April 14.

JOHN B. GILLIE, 64, president of the Tonawanda Machine Co., Buffalo, died suddenly in Tonawanda on April 12.

Forthcoming Meetings

AMERICAN WELDING SOCIETY—Annual meeting at Society headquarters, New York City, April 22-25. M. M. Kelly, 33 West 39th St., New York, is secretary.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—General Cost Conference at Hotel Cleveland, Cleveland, Ohio, April 22-23. E. F. DuBrul, 1415 Enquirer Bldg., Cincinnati, is general manager.

CHAMBER OF COMMERCE OF THE U. S.—Eighteenth annual meeting, Chamber of Commerce Bldg., Washington, D. C., April 28-May 1. Headquarters, U. S. Chamber of Commerce Bldg., Connecticut Ave. & H St., N.W., Washington.

NATIONAL POWER SHOW — Held in connection with the International Textile Exposition, Mechanics Bldg., Boston, Mass., April 28 to May 3. For information write to New England Association of Commercial Engineers, 53 Devonshire Road, Boston.

TAYLOR SOCIETY — Spring meeting, Columbus, Ohio, May 1 and 2. P. E. Henderson, 29 West 39th St., New York City, is assistant secretary.

AMERICAN IRON & STEEL INSTITUTE —Spring meeting at the Commodore hotel, New York, N. Y. on May 9.

AMERICAN FOUNDRYMEN'S ASSOCIATION — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is secretary-treasurer.

STEEL FOUNDERS SOCIETY OF AMERICA—May meeting, Hotel Hollenden, Cleveland, Ohio, May 14. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fifth national aeronautic meeting, May 19-21, Dayton, Ohio, and Wright field. Calvin W. Rice, 29 West 39th St., New York, is secretary.

NATIONAL FOREIGN TRADE COUNCIL —Convention at Hotel Biltmore, Los Angeles, May 21-23. O. K. Davis, 1 Hanover Square, New York City, is secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS —1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

ASSOCIATED MACHINE TOOL DEALERS —Meeting at Granville Inn, Granville, Ohio, June 4 to 5. A. G. Bryant, 2558 West 16th St., Chicago, is secretary.

NATIONAL ASSOCIATION OF FOREMEN —Convention at Toledo, Ohio, June 6-7. Harry J. Baumker, 316 Tenth St., Toledo, is convention secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 9 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

NATIONAL ASSOCIATION OF PURCHASING AGENTS—Fifteenth annual convention, Stevens Hotel, Chicago, June 16-19. "Inform - A - Show" in conjunction. G. A. Renard, 11 Park Place, New York City, is secretary-treasurer.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

WORLD POWER CONFERENCE—Second annual conference, Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Bldg., Washington, is American chairman.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

STEEL FOUNDERS' SOCIETY OF AMERICA—Semi-annual convention, Greenbrier Hotel, White Sulphur Springs, Va., June 26-27. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eisenman, 7016 Euclid Ave., Cleveland, is secretary.

Rise and Fall of the Market

RESERVE stocks of refined copper (22,897 tons), the heaviest in eight years, necessitated the break of 4c. per lb., which occurred last week in electrolytic. Copper prices held out for exactly a year, meanwhile those of other non-ferrous metals rose and fell. Tin, lead, zinc, solder, nickel rods and scrap lead declined in price this week. There were no appreciable advances in any form of metal. Bolt dealers are still cutting prices—a practice begun last fall. The discounts of 50—10 per cent on large and 60 per cent on small, have given way in some instances to 65 per cent, which rate the dealers regard as representing profitless business.

(All prices as of Apr. 18, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@ 22.26
Virginia No. 2	24.04
Basic	19.75@ 20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.55
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10	3.35†	3.30	3.60†
No. 12	2.15	3.45†	3.35	3.65†
No. 14	2.25	3.55†	3.45	3.70†
No. 16	2.35	3.65†	3.55	3.80†
Black				
Nos. 18 to 20	2.35@2.45	3.85†	3.55	3.70
No. 22	2.50@2.60	4.00†	3.70	3.85
No. 24	2.55@2.65	4.05†	3.75	3.90
No. 26	2.65@2.75	4.15†	3.85	4.00
No. 28	2.80@2.90	4.75†	4.00	4.15
Galvanized				
No. 10	2.60@2.70	3.90†	3.80	3.55
Nos. 12 to 14	2.70@2.80	4.00†	3.90	3.65
No. 16	2.80@2.90	4.10†	4.00	3.75
No. 18	2.95@3.05	4.25†	4.15	3.90
No. 20	3.10@3.20	4.40†	4.30	4.05
No. 22	3.15@3.25	4.45†	4.35	4.10
No. 24	3.30@3.40	4.60†	4.50	4.25
No. 26	3.55@3.65	4.85†	4.75	4.50
No. 28	3.80@3.90	5.10†	5.00	4.75

*Light Plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt	56.02%	43.48%	55.5%	43.5%	57.3%	44.8%
3½ to 6 in. lap	52. 6%	40.06%	53.5%	40.5%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches External	Diameter in Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness Decimal	B.w.g. and Fractions	Outside Diameter in Inches ½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.2	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ⅛-in. thick by ¾-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—⅛, 8.35c. per lb.; ¼, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.25
Tin, Straits, pigs, New York			38.00@39.00
Lead, pigs, E. St. Louis	5.40@5.42½	New York	6.67½@7.12½
Zinc, slabs, E. St. Louis	4.85	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.50	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.25@11.00	11.75	10.11
Solder (½ and ½).....	28.00	27.50	26@28

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade.....	56.00
Commercial genuine, intermediate grade.....	42.00
Anti-friction metal, general service.....	31.00
No. 4 babbitt, f.o.b.....	11.25

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	14.75@15.25	13.50	14.00@14.50
Copper, heavy, and wire..	13.50@14.00	13.00	13.00@13.50
Copper, light, and bottoms	12.00@12.25	12.00	12.00@12.50
Heavy lead.....	4.00@ 4.25	5.25	3.50@ 4.00
Tea lead.....	2.25@ 2.50	3.25	2.50@ 3.00
Brass, heavy, yellow....	7.75@ 8.00	8.00	7.25@ 7.75
Brass, heavy, red.....	11.25@11.75	12.50	10.25@10.75
Brass, light.....	6.25@ 6.75	7.00	6.25@ 6.75
No. 1 rod-brass turnings.	9.00@ 9.25	8.00	8.00@ 8.50
Zinc.....	2.50@ 2.75	3.00	2.00@ 2.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton, waste, white, per lb....	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb....	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.01¾	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.15	.164	.154
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting..	per lb.	.034	.034	.035
Brass rods.....	per lb.	.2125	.2125	.2487½
Solder (½ and ½).....	per lb.	.28	.275	.35
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.75	.75	.55
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.60
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	14.25
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws::	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Swampscott — High School Building Comn.—machinery and equipment for manual training shop for proposed new high school. Estimated cost $500,000.

Mich., Detroit—Detroit Waste Works, 7355 Bryden Ave.—cutter for cutting scrap metal.

Mo., Freeburg—Gaines Bros. Co.—hammer, one belt power, 50 or 100 lb.

Ont., Hamilton—B. Greening Wire Co., Queen St. N.—machinery and equipment for proposed 4 story, 70 x 112 ft. addition to factory. Estimated cost $60,000.

Ont., Welland—Canadian Mead Morrison Co., 317 Main St. S., R. M. Beatty, Purch. Agt. (contractors equipment)—interested in prices complete equipment for proposed 1 story, 60 x 100 ft. factory.

Ont., Wingham—J. A. McLean—interested in prices on complete equipment for planing mill and machine shop to replace fire loss. $25,000.

N. Z., Wellington—New Zealand Government Railways—will receive bids until July 16 for two underhung traveling jib cranes, 30 cwt. capacity and two overhead electric traveling cranes, 30 cwt. capacity.

Opportunities for Future Business

Ala., Birmingham—Tennessee Coal, Iron & Railroad Co., B-M. Bldg., subsidiary of United States Steel Corp., 71 Broadway, New York, N. Y., plans expansion and improvement program of holdings in Birmingham district, including additional furnace, alterations to present blooming mill, installation of rolling mill and additions to Fairfield sheet mill. Estimated cost approximately $8,000,000 to $9,000,000.

Calif., Los Angeles—Dept. of Public Works, Sacramento, will receive bids until May 13 for the construction of maintenance stations including garage, shops, etc., in Orange and Ventura counties, here.

Conn., Hartford—House of Good Shepard, 170 Sisson St., will soon award contract for the construction of a home including 2 story, 45 x 180 ft. industrial building, etc. Estimated cost $400,000.

Conn., Waterbury—Lux Clock Co., 97 Sperry St., is having plans prepared for a 4 story, 35 x 85 ft. factory. Estimated cost $75,000. T. M. Freney, 51 Leavenworth St., archt.

Ill., Chicago — Gobatti Foundry, is having plans prepared for extensions and improvements to machine shop and foundry.

Ill., Chicago—Aridor Co., 589 East Illinois St., is having plans prepared for a 2 story, 132 x 350 ft. factory for the manufacture of caps for glass containers, etc. at 3428-40 West 48th Pl. Estimated cost $125,000. A. Epstein, 2001 West Pershing Rd., archt.

Ind., Anderson — Ames Shovel & Tool Co., awarded contract for the construction of a 1 story, 200 x 300 ft. factory on North Anderson St. Estimated cost $50,000. E. F. Miller, Anderson, Archt.

Ind., Beech Grove — Cleveland, Cincinnati, Chicago & St. Louis Ry. Co., 230 East 9th St., Cincinnati, received lowest bid for the construction of a 1 story, 184 x 444 ft. railroad shop building from Ellington-Miller Construction Co., Chicago, Ill. H. Baldwin, Ch. Engr.

Ind., Indianapolis—Lincoln Oil Co., 121 East Maryland Ave., awarded contract for the construction of a garage and service station at 63rd and College Ave. Estimated cost $41,000.

Ind., Lafayette—H. H. Homer, had plans prepared for a 1 story, 130 x 165 ft. machine shop and garage on East Main St. Estimated cost $50,000. F. P. Riedel, Archt.

Md., Baltimore—Stewart & Co., Howard and Lexington Sts., plans the construction of a 2 story, 143 x 200 ft. garage and warehouse at 641 West Saratoga St. Estimated cost $200,000. J. E. Sperry, Calvert Bldg., Archt. H. F. Doeleman, Baltimore Trust Bldg., Engr.

Mass., Barnstable—B. C. Bassett, plans the construction of a 1 story service station at Barnstable and Lyanough Rds. Estimated cost $40,000. Private plans.

Mass., Boston—F. T. Mahoney, 85 Devonshire St., awarded contract for the construction of a 1 story repair shop and service station at 2-14 East Concord St. Estimated cost $40,000.

Mass., Brockton—Brockton Ice & Coal Co., 27 Lawrence St., plans to rebuild woodworking shop, blacksmith shop and garage destroyed by fire. Estimated cost $40,000. Architect not selected.

Mass., Mansfield—A. Pedini, 309 North Main St., awarded contract for the construction of a 1 story garage, service station and repair shop on Main St. Estimated cost $40,000. Noted Apr. 10.

Mass., Newton (br. Boston)—N. T. Turner, 320 Washington St., awarded contract for addition and alterations to service garage and shop. Estimated cost $40,000. Noted Mar. 6.

Mass., Swampscott—Town, H. S. Baldwin, Ch. Bldg. Comn., is having sketches made for the construction of a 2 story high school including manual training department, etc. Estimated cost $500,000. Gram & Ferguson, 248 Boylston St., Boston, archts.

Miss., Yazoo City — Woolvine & Hull, received lowest bid for the construction of a 1 story, 140 x 160 ft. garage and service station on Washington St. from W. R. Ellis, Clarksdale, $36,000. Noted Mar. 27.

Mo., St. Louis — F. M. Stambaugh & Sons Inc., 4356-58 Maffitt Ave., awarded contract for a 1 story, 100 x 132 ft. factory at Sacramento Ave. near Kingshighway.

N. J., Bloomfield—General Electric Co., Lawrence St., awarded contract for the construction of a 1 story, 45 x 135 ft. addition to Factory No. 12. Estimated cost $40,000.

N. J., Browns Mills—F. Grad, 1023 Broad St., Newark, Archt., will receive bids until May 5, for a 4 story sanitorium including vocational shop, service building, etc. here for Deborah Jewish Consumptive Relief Society. M. L. Unger, Chn. of Bldg. Comm. Estimated cost $1,000,000. T. B. Kedner, 175 5th Ave., New York, N. Y., Assoc. Archt.

N. J., Hawthorne—S. Braen, 115 Totawa Ave., Paterson, is having preliminary plans prepared for the construction of a 2 story, 90 x 140 ft. garage at Pasadena and Nelson Aves. Estimated cost $150,000. J. C. Van Vlandren, 140 Market St., Paterson, archt.

N. J., Linden—Commercial Steel Equipment Co., 1024 Elizabeth Ave., rejected bids for a 1 story factory. Estimated cost $40,000. A. J. Silberstein, 868 Broad St., Newark, Archt. Noted Apr. 3.

N. Y., Brooklyn—Court Sq. Sales & Renting Co., J. Weinstein, Pres., 26 Court St., will receive bids about June 1 for an 8 story garage and service station at Pacific St. and Boerum Pl. Estimated cost $375,000. J. S. Kennedy, 157 Remsen St., Archt. Noted Oct. 24.

N. Y., Brooklyn—Jasol Holding Corp., 1440 55th St., will receive bids about Sept. 1 for a 2 story, 100 x 101 ft. garage at Senator St. and East Ridge Blvd. Estimated cost $50,000. Cohn Bros., 361 Stone Ave., Archt.

N. Y., Brooklyn — Parkway Center Building Corp., 350 Stone Ave., will receive bids about Oct. 1 for a 2 story, 92 x 177 ft. garage at East New York Ave. and Schenectady St. Estimated cost $60,000. H. M. Sushan, 357 Fulton St., Archt. Noted Feb. 13.

N. Y., Buffalo—W. Simons Estate, Liberty Bank Bldg., awarded contract for the construction of a 1 story, 100 x 220 ft. factory at 1320 Main St. Estimated cost $50,000. General Motors Parts Dept., General Motors Bldg., Detroit, Mich., lesseae.

N. Y., Glendale—Phil Dietz Coal Co., plans the construction of a 119 x 127 ft. garage and shop at 62nd St. and 74th Ave. Estimated cost $40,000. H. C. Brucker, 2424 Myrtle Ave., Archt.

N. Y., Jamaica—Krug Baking Co., 139-01 95th Ave., plans the construction of a 2 story, 92 x 110 ft. garage at 94th Ave. and 138th Pl. Estimated cost $75,000. E. R. Fennema, c/o owner, archt.

N. Y., Long Island City—J. S. Kennedy, 157 Remsen St., Brooklyn, archt., will receive bids about June 1 for the construction of a 100 x 120 ft. garage at 101 Ave. and 121st St. for M. G. C. Realty Co., c/o archt. Estimated cost $40,000. Noted Mar. 27.

N. Y., Long Island City—Rhodes & Schamfeld, 31-88 33rd St., plans the construction of a 75 x 160 ft. garage and service station at Broadway and 23rd St. Estimated cost $40,000. C. Marsac, 31-06 30th Ave., Astoria, archt.

N. Y., New York—Forty-Four West 66th St. Corp., c/o Bloch & Hess, 18 East 41st St., Archts., will soon award contract for a 2 story garage at 44 West 66th St. Estimated cost $150,000. Noted Mar. 6.

N. Y., New York—Gerosa Paladino Holding Corp., 286 East 137th St., plans the construction of a 100 x 320 ft. garage at Webster Ave. and 182nd St. Estimated cost $75,000. DeRose & Cavalieri, 370 East 149th St., archts.

N. Y., New York — Kent Garage Investing Co., 350 Madison Ave., will receive bids about Nov. 1, for the construction of a garage at 42nd St. between 8th and 9th Aves.

O., Canton — Union Metal Mfg. Co., 1432 Maple Ave. N. E., plans the construction of a 1 story, 46 x 240 ft. factory for the manufacture of metal lighting standards. Estimated cost $40,000. Private plans.

O., Cleveland—Euclid Machine & Engineering Co., A. C. Smeller, 1838 Noble Rd., had plans prepared for the construction of a 1 story, 70 x 100 ft. factory and office. Estimated cost $40,000. E. G. Hoefler, 5005 Euclid Ave., archt.

O., Cleveland—Union Steel Products Co., J. E. Union, Pres., 13009 Athens Ave., had plans prepared for the construction of a 1 story, 60 x 100 ft. factory at Jennings Rd. and Jennings Ave. Estimated cost $40,000. W. H. Hatch, 562 Hippodrome Bldg., Archt.

Okla., Henryetta — G. E. Crain, is having preliminary plans prepared for a 100 x 140 ft. machine shop. Estimated cost $40,000. Private plans.

Pa., McKeesport—Firth Sterling Steel Co., awarded contract for a 2 and 3 story, 50 x 120 ft. experimental laboratory building. Noted Mar. 13.

Pa., Meadville—The Hookless Fastener Co., East Arch St., awarded contract for a 3 story, 50 x 70 ft. factory. Noted Apr. 10.

Pa., Washington—Bd. of Education, plans the construction of a 3 story, 62 x 350 ft. junior and senior high school including, 72 x 125 ft. shop, etc. at Jefferson Ave. W. Estimated cost $900,000. E. B. Lee, 1210 Chamber of Commerce Bldg., Pittsburgh, archt. C. L. Woolridge, Fulton Bldg., Pittsburgh, const. engr.

R. I., Pawtucket—United Electric Railway Co., 100 Fountain St., Providence, is having plans prepared for the construction of a bus terminal and garage including repair shop on Newell Ave. Estimated cost to exceed $50,000. N. W. Sanborn, 100 Fountain St., Providence, archt.

R. I., Providence—Owner, c/o C. H. Lockwood, 171 Westminster St., will soon award contract for addition to jewelry factory. Estimated cost to exceed $40,000.

R. I., Woonsocket—Firestone Tire & Rubber Co., 141 Brookline Ave., Boston, Mass., is receiving bids for a 1 story service station here, also 1 story service station at High and Warren Sts., Brockton, Mass.; awarded contract for a 50 x 110 ft. service station at Oakley and Fayette Sts., Hammond, Ind. Estimated cost $50,000, $40,000 and $44,000 respectively.

Wis., West Allis — Allis-Chalmers Co., will soon award contract for the construction of a 1 story, 45 x 300 ft. factory on Greenfield St. Private plans.

Ont., Brampton—Calders Ltd., 388 St. James St., Montreal, Que., plans the construction of a creosoting plant. Estimated cost $50,000. J. Kulis, c/o W. P. Hinton, 1407 Royal Bank Bldg., Toronto, Engr.

Ont., Fort William—Bd. of Education, A. C. Adams, Chn., is having plans prepared for the construction of a technical school on Myles St. Estimated cost $300,000. R. E. Mason, 2 Francis Block, Archt.

Ont., Hamilton—Central Garage Co., Catharine St. N., plans the construction of a 3 and 4 story, 140 x 150 ft. garage on King William St. Estimated cost $200,000. Engineer not selected.

Que., Pointe St. Charles—Canadian National Rys., Montreal, plans the construction of a foundry, here. C. S. Gzowski, Ch. Engr.